TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, ~~1900~~ 1902.

No. ~~281~~ 69.

WHITNEY LAYTON, PLAINTIFF IN ERROR,

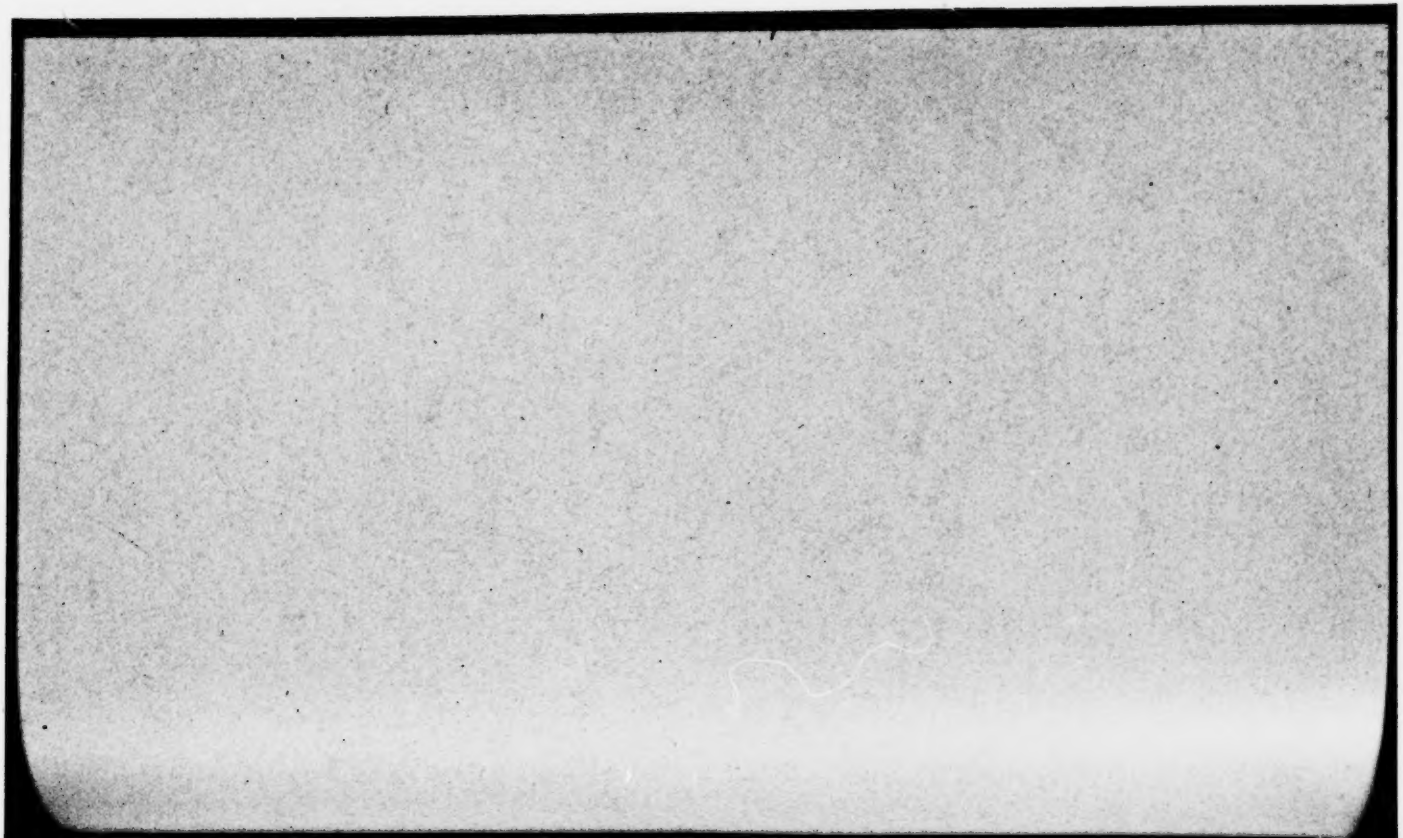
vs.

THE STATE OF MISSOURI.

IN ERROR TO THE SUPREME COURT OF THE STATE OF MISSOURI.

FILED MARCH 20, 1901.

(18,094.)



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FROM THE

St. Louis Court of Criminal Correction.

NO..... ....A. D. 1900.

THE STATE OF MISSOURI, Plaintiff,

vs.

WHITNEY LAYTON, Defendant.

TRANSCRIPT.

HENRY A. CLOVER, Jr., Prosecuting Attorney,
STEWART, CUNNINGHAM & ELIOT,
Attorneys for the Plaintiff.

SEDDON & BLAIR,
and STANLEY STONER,
Attorneys for the Defendant.

1 & 2 The United States of America to the State of Missouri, Greeting:

You are hereby cited and admonished to be and appear in the Supreme Court of the United States at Washington, D. C., not exceeding thirty days from and after the day this citation bears date, pursuant to a writ of error, filed in the clerk's office of the supreme court of Missouri, wherein Whitney Layton is plaintiff in error, and you are defendant in error, to show cause, if any there be, why the judgment rendered against the said plaintiff in error, as in the said writ of error mentioned, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

Witness, the Honorable Thomas A. Sherwood, presiding judge of the division number two of the supreme court of Missouri, this 27th day of February, in the year of our Lord one thousand nine hundred and one.

T. A. SHERWOOD,
Presiding Judge.

[Endorsed:] United States circuit court western district of Missouri, central division. —— —— *vs.* —— ——. Citation. Filed Feb. 27 1901. Jno. R. Green, clerk.

UNITED STATES OF AMERICA, } *ss:*
Central Division of the Western District of Missouri, }

I hereby acknowledge due service of the within citation, this 27th day of February, A. D. 1901.

EDWARD C. CREW, *Att'y Gen'l.*

3 UNITED STATES OF AMERICA, *ss:*

The President of the United States to the honorable the judges of the division number two of the supreme court of the State of Missouri, Greeting:

Because, in the records and proceedings, as also in the rendition of the judgment of a plea which is in the said supreme court, before you, at the October term, 1900, thereof, between The State of Missouri, respondent, and Whitney Layton, appellant, a manifest error hath happened, to the great damage of the said appellant, as by his complaint appears. We being willing that error, if any hath been, should be duly corrected and full and speedy justice done to the parties aforesaid in this behalf, do command you, if judgment be therein given, that then, under your seal, distinctly and openly, you send the record and proceedings aforesaid, with all things concerning the same, to the Supreme Court of the United States, together with this writ, so that you have the same at Washington, D. C., within thirty days from the date of the citation in this cause, in the said Supreme Court, to be then and there held; that the record and pro-

ceedings aforesaid being inspected, the said Supreme Court may cause further to be done therein to correct that error, what of right, and according to the laws and customs of the United States, should be done.

Witness, the Honorable Melville W. Fuller, Chief Justice of the Supreme Court of the United States, this 27th day of February, in the year of our Lord one thousand nine hundred and *and* one.

Issued at office in the city of Jefferson with the seal of the circuit court of the United States, for the western district of Missouri central division, dated as aforesaid.

{Seal of the United States Circuit Court for the Western District of Missouri, Central Division.}

H. C. GEISBERG,
Clerk Circuit Court United States, Western District of Missouri, Central Division.

Allowed by
T. A. SHERWOOD,
Presiding Judge.

[Endorsed:] No. —. United States circuit court, western district of Missouri. State of Missouri, resp't, *vs.* Whitney Layton, app't. Writ of error to the supreme court of the State of Missouri. Filed Feb. 27, 1901. Jno. R. Green, clerk.

Return to Writ.

UNITED STATES OF AMERICA, *Western District of Missouri,* } *ss:*

In obedience to the command of the within writ, I herewith transmit to the Supreme Court of the United States a duly certified transcript of the record and proceedings in the within-entitled case together with all things concerning the same.

In witness whereof, I hereunto subscribe my name and affix the seal of said supreme court, at the city of Jefferson, this 25th day of March, A. D. 1901.

[Seal of the Supreme Court of Missouri.]

JNO. R. GREEN, *Clerk.*

4 In the Supreme Court of Missouri, October Term, 1900.
Division No. 2.

STATE OF MISSOURI, *set:*

Be it remembered, that heretofore, to wit, on the 15th day of August, 1900, there was filed in the clerk's office of the supreme court of the State of Missouri, a transcript of the record wherein The State of Missouri was respondent and Whitney Layton was appellant, which said transcript is in words and figures as follows, to wit:

Transcript of the Record.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

In the St. Louis Court of Criminal Correction,

Charged with manufacturing and selling compounds intended to be used in the preparation of food. Sess. Acts 1899, page 170.

BE IT REMEMBERED that the following proceedings in the above entitled case were had on the 31st August, 1899.

August 31, 1899.

At this day comes the Prosecuting Attorney and files the information herein, duly sworn to before the clerk, which information is in the following words and figures:

State of Missouri,)
) ss.
City of St. Louis.)

In the St. Louis Court of Criminal Correction,

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

St. Louis, August 30, 1899.

Charged with manufacturing and selling compounds intended to be used in preparation of food. Sess. Acts 1899, page 170.

RICHARD M. JOHNSON, Assistant Prosecuting Attorney, of the St. Louis Court of Criminal Correction, now

here in Court, on behalf of the State of Missouri, information makes as follows:

That Whitney Layton in the city of St. Louis, on the 28th day of August, 1899, then and there doing business in this State, did unlawfully manufacture, sell and offer to sell a certain compound and preparation, to-wit: Layton's Health Food Baking Powder, which said compound and preparation was so manufactured and sold for the purpose of being used and was intended by said Layton to be used in the preparation of food in which said compound and preparation so manufactured and sold there was alum. Contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State.

Rich. M. Johnson,
Asst. Pros. Att'y of the St. Louis Court of Crim. Correction.

State of Missouri,)
) ss.
City of St. Louis.)

Charles J. Bauer being duly sworn upon his oath says, that the facts stated in the above information are true.

Chas. J. Bauer.

Sworn to and subscribed before me this 30th day of August, 1899. Alfred J. Wagenman,
Clerk of the St. Louis Court of Criminal Correction.
[Seal] By E. S. Barnard, Deputy Clerk.

And on the 11th January A. D., 1900 the following proceedings were had:

January 11, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Charged with selling compounds, etc.

Now at this day comes the Prosecuting Attorney for the State, and the defendant in his own proper person also comes, and having seen and heard read the information herein, says he is not guilty in manner and form as therein charged and waives a jury.

And on the 31st March, 1900 the following further proceedings were had:

March 31, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day comes the Prosecuting Attorney for the State and defendant in his own proper person also comes, and the court having fully heard the evidence and being fully advised of and concerning the premises, doth find the defendant guilty of said charge. It is therefore considered and adjudged by the court that the said defendant for his said offense pay to the State of Missouri for the use of the city of St. Louis a fine of $100, together with the costs herein accrued.

And on the second day of April A. D., 1900 the following further proceedings were had:

April 2, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day comes the defendant by his attorney and files his motion for a new trial herein.

And on the 7th April, 1900 the following further proceedings were had:

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day the court having heard the argument of counsel touching the motion of defendant, for a new trial herein, and being fully advised of and concerning the same, doth order and determine that the said motion be overruled.

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day comes the defendant by his attorneys and files a motion in arrest of judgment herein, and the court having heard the argument of counsel touching the said motion herein and being fully advised of and concerning the same, doth order and determine that said motion be overruled.

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day comes the defendant by his attorneys and on his motion the court orders that he shall have leave to file his bill of exceptions within thirty days from April 7, 1900.

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day again comes the Prosecuting Attorney for the State and the defendant in his own proper person also comes. Wherefore it is considered by the court that the said defendant for said offense and in pursuance of the finding of the court aforesaid pay to the State of Missouri for the use of the city of St. Louis a fine of $100 together with costs

herein accrued. Thereupon again comes the defendant by his attorney and prays an appeal from the judgment of this court to the Supreme Court of the State of Missouri, and the court being of the opinion that there is probable cause for such appeal doth grant the same, and defendant having filed his affidavit for appeal and appeal bond with good and sufficient securities approved by the court, it is ordered by the court that this appeal shall operate as a supersedeas until this cause shall be heard and determined by the Supreme Court of the State of Missouri, which said appeal bond is as follows:

In the St. Louis Court of Criminal Correction,

State of Missouri,
vs.
Whitney Layton,

On charge of manufacturing and selling compounds, etc.

And now comes the defendant in the above entitled cause, who being first duly sworn upon his oath says: That the appeal in the above entitled cause is not made for vexation or delay, but because affiant believes that the appellant is aggrieved by the judgment or decision of the Court.

Whitney Layton.

Sworn to and subscribed before me, this 7th day of April, 1900. A. J. Wagenman, Clerk.

KNOW ALL MEN BY THESE PRESENTS, That we, Whitney Layton, as principal, and Max M. Bodenheim, as security, are held and firmly bound unto the State of Missouri in the sum of five hundred dollars lawful money of the United States for the payment whereof, well and truly to be made, we bind ourselves, our heirs, executors and administrators, jointly and severally, firmly by these presents.

The condition of this recognizance is such, that whereas, the St. Louis Court of Criminal Correction, in the case of the State of Missouri vs. Whitney Layton has allowed the defendant an appeal from its judgment to the Supreme Court of Missouri. Now if the above bounden Whitney Layton shall appear in the said St. Louis Court of Criminal Correction at such time and place as the said Supreme Court

of Missouri, aforesaid shall direct, and shall render himself in execution and obey every order and judgment which shall be made or rendered in the premises, then this recognizance shall be void: otherwise to remain in full force, virtue and effect.

IN TESTIMONY WHEREOF, we have hereto set our hand and seal this 7th day of April in the year of our Lord, nineteen hundred.

[Seal] Whitney Layton,
[Seal] Max. M. Bodenheim,

Approved by the Court.
Alfred J. Wageman, Clerk.

On the 25th day of April, 1900 the following further proceedings were had:

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day again comes the defendant by his attorneys and files his bill of exceptions herein, which bill of exceptions of the defendant is in the following words and figures, to-wit:

State of Missouri,)
) ss.
City of St. Louis.)

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

In the St. Louis Court of Criminal Correction,

BILL OF EXCEPTIONS OF DEFENDANT.

Be it remembered that the above entitled cause coming on for trial on this 11th day of January A. D., 1900, before Honorable Willis H. Clark, judge, the following proceedings were had:

Appearances:

Mr. H. A. Clover, Jr.,
Messrs. Edward Cunningham, Jr., and
Edward C. Eliot, for the plaintiff.

Mr. James A. Seddon and
Mr. Stanley Stoner, for the defendant.

In order to sustain the issues the State introduced the following proofs and testimony:

Mr. Cunningham read the information as follows:

State of Missouri,)
) ss.
City of St. Louis.)

In the St. Louis Court of Criminal Correction,

St. Louis, August 30, 1899.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Charged with manufacturing and selling compounds intended to be used in preparation of food. Sess. Acts 1899, page 170.

RICHARD M. JOHNSON, Assistant Prosecuting Attorney, of the St. Louis Court of Criminal Correction, now here in Court, on behalf of the State of Missouri, information makes as follows:

That Whitney Layton in the city of St. Louis, on the 28th day of August, 1899, then and there doing business in this State, did unlawfully manufacture, sell and offer to sell a certain compound and preparaton, to-wit: Layton's Health Food Baking Powder, which said compound and preparation was so manufactured and sold for the purpose of being used and was intended by said Layton to be used in the preparation of food in which said compound and preparation so manufactured and sold there was alum. Contrary to the form of the Statute in such case made and provided, and against the peace and dignity of the State.

Rich. M. Johnson,
Asst. Pros. Att'y of the St. Louis Court of Crim. Correction.

State of Missouri,)
) ss.
City of St. Louis.)

Charles J. Bauer being duly sworn upon his oath says, that the facts stated in the above information are true.

Chas. J. Bauer.

Sworn to and subscribed before me this 30th day of August, 1899. Alfred J. Wagenman,
Clerk of the St. Louis Court of Criminal Correction.
[Seal] By E. S. Barnard,
Deputy Clerk.

Whereupon the State introduced the following stipulation.

State of Missouri,)
) ss.
City of St. Louis.)

In the St. Louis Court of Criminal Correction.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

For the purpose only of the trial of this cause and at said trial the defendant Whitney Layton for a stipulation covering a part of the facts in the above entitled case, admits that in the city of St. Louis, Missouri, on the 28th day of August, 1899, he, the defendant, then and there doing business in the State of Missouri did manufacture sell and offer to sell to J. M. Houston Grocer Company, then doing business at said city, a certain compound and preparation, to-wit: One case containing two dozen, one pound cans of baking powder, known and designated as Layton's Health Food Baking Powder, which said compound and preparation, so manufactured sold and offered for sale by him for the purpose of its being used and was intended by defendant and by said J. M. Houston Grocer Company to be used in the preparation of food.

Defendant further admits that in said compound and preparation so manufactured, sold and offered to be sold by him there was alum, and that the fact that the same contained alum was then well known to defendant; and it is further agreed and stipulated that at the trial of this case either party may offer any other evidence not inconsistent with the above facts which he may deem material, relevant and competent in the case, subject to objection by the other party to its materiality, relevancy or competency.

Stewart, Cunningham & Eliot, with H. A. Clover, Jr.,
Prosecuting Attorney, for Plaintiff.
Seddon & Blair, Stanley Stoner,
Attorneys for Defendant.

Mr. Cunningham: That is all the testimony we have to offer and we rest our case in chief.

Whereupon the defendant to sustain the issues on his part introduced proofs and evidence as follows:

WHITNEY LAYTON, being called and sworn testified in his own behalf as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Whitney Layton.

Q. You are the defendant in this case? A. Yes, sir.

Q. And you reside in the city of St. Louis? A. Yes, sir.

Q. What business are you engaged in, Mr. Layton? A. I am engaged in the business of manufacturing and selling baking powder.

Q. How long have you been engaged in that business? A. Nearly six years.

Q. Have you given much attention to the trade in the baking powder business as it exists in the United States at the present time and especially in the State of Missouri? A. Yes, sir; I have given it my entire time and attention.

Mr. Cunningham: I object not because it has as yet developed that the answer of the witness will not lead up to something else but as far as it appears now I submit that the question is irrelevant to any of the issues in this case.

Mr. Seddon: Why do you say it is irrelevant?

Mr. Cunningham: It is certainly immaterial whether he is familiar with the business of making and selling baking powder, as far as this case is concerned.

The Court: I suppose that this is leading up to something else. I will take the testimony subject to the objection.

Mr. Seddon: I do not want to dodge the issue raised by his objections and I suppose we might as well meet it now as it will surely have to be met later on. * * *

Mr. Seddon: The State at the last session of the Legislature enacted a law with which the Court is thoroughly familiar prohibiting the manufacture and sale of any food products containing arsenic, bismuth, calomel, ammonia and alum, making it a misdemeanor for anyone to engage in the manufacture and sale of any food products containing those substances. We propose to show as a defense in this case that alum, one of the substances named in that law, is largely used in the manufacture of baking powder and that the baking powder business is an old and well established business, we propose to show the history of the trade and that as a matter of fact alum as used in the manufacture of baking powder is perfectly harmless and is a useful article of commerce for that purpose and we will undertake to show to this Court that the Legislature went beyond the scope of its authority and the constitutional limitations of its powers when it enacted the law on which this prosecution is based. We propose to show further that the baking powder business first originated in the manufacture of what is now known in the trade as cream of tartar baking powder, that for a number of years the cream of tartar baking powder was almost if not exclusively used in the making of bread and other articles of food; that afterward there was introduced into the market baking powder containing alum in the place of cream of tartar, that is to say, the alum was substituted for the cream of tartar and served the same purpose at a much reduced cost. That up to that time, say along in 1878 or '79 the so-called cream of tartar baking powders were the only baking powders in general use on the market. That about 1878 or 1879 a new baking powder was introduced, as I before stated, in which was substituted alum for the cream of tartar and that owing to this substitution the manufacturers of the so-called alum baking powders were enabled to put their goods

on the market at a much lower price than the manufacturers engaged in making cream of tartar baking powder and that the business has grown and extended year by year until alum baking powder is an article of almost universal use, not only in the State of Missouri, but throughout the United States and that it is sold and kept in stock by nearly every grocer in the United States and in the State of Missouri. That its manufacture and sale represents a trade of millions of pounds amounting to, in the aggregate, something like one hundred million pounds annually. We will further show that within a recent period a gigantic corporation has been formed, which we will not refer to as a trust because we have no jury here but as a matter of fact this corporation was organized to absorb the business of manufacturing the so-called cream of tartar baking powder and that it has been waging an unceasing warfare against the manufacturers of the alum baking powder and that when this Act of the Legislature was passed it struck down the manufacture and sale of millions of pounds of baking powder annually and has in fact made a discrimination, by this enactment, in favor of this corporation and against a trade that had grown to immense proportions and a business that was putting on the market a useful article used in the preparation of food; that by its arbitrary enactment the Legislature has deprived the people of this State of a useful substance used in the manufacture of food.

I will be frank with the Court in making this statement that the trend of the decisions which we have been able to find are against the general proposition that might be laid down as governing in cases like this but we believe that in this particular case there are facts and circumstances which are very material in enabling the Supreme Court to determine the validity of the law in question and in doing justice between man and man I do not believe that the Supreme Court of the State of Missouri will strike down this enormous trade at the dictation of the Legislature of the State of Missouri. It is our idea to make a test case of this in order that we may have a square decision of the Court, right on the merits of the question. It is our purpose in this case to show, and the evidence we rely on will show that this act of the Legislature was aimed at a substance that as I have already stated was largely used in the manufacture of a sub-

stance used in the preparation of food and that as a matter of fact the substance itself is perfectly harmless and is of the greatest use in the economy of the household.

Mr. Cunningham: If the Court please, it seems to me that all of the facts necessary to enable the Court to reach a conclusion as to the guilt or innocence of this defendant, of the misdemeanor charge, are already in evidence and are undisputed, but counsel for defendant now undertakes to offer evidence to induce this Court to say that the act of the Legislature is unconstitutional. I apprehend I am fair with counsel and the Court in saying that this is the object for which they are seeking to introduce this evidence. Now as I understand the rule of law it is plain that evidence is information given to the trier of the fact of a disputed issue of fact. It is addressed solely to the trier of the fact upon a disputed question of fact in connection with the case. Now as I understand this case the facts sufficient to establish the guilt of the defendant are already in evidence and are undisputed and the only issue left in this case is the issue of law as to whether or not this statute is unconstitutional and is beyond the powers of the Legislature in the exercise of its power in enabling laws for the government of the State. This question is before the Court and not before a jury and is solely a question of law. The stipulation which I offered in evidence in my case in chief contained the undisputed facts sufficient to establish the guilt of the defendant and it is not now for this Court to hear evidence upon the proposition or upon the theory as laid down by counsel for defendant but it is for the court to judge solely, as a question of law, whether or not this act of the Legislature is constitutional. The Court must consider this matter as it appears upon its face and nothing along the line of testimony suggested by counsel for defendant would throw any light on this question or would in any way enable the Court to determine the constitutionality of the statute.

The Court will only take judicial notice of those things that every intelligent person is presumed to know as a matter of general knowledge. It is only with such facts as those that the Court can concern itself and it will not go beyond that and take judicial notice of facts that are perhaps known only to a particular trade or profession or business for such facts would not in any way enable the Court to determine the

constitutionality of the law in question. Those matters of which it will take judicial notice are matters that are universally received as being undisputed but in a case of this kind in determining the issue of law it is not for this Court to go into matters that will surely develop questions of scientific dispute and about which opinions are widely divergent. If their evidence is received showing, as it perhaps will, a given state of affairs regarding the use of this substance we will introduce evidence showing exactly to the contrary and how then can the Court receive those facts in assisting it in determining what is purely a question of law. I hardly think it necessary in a matter of this kind to urge my position before the Court because the proposition is so plain that I need not cite any authorities in support of it. As a matter of fact this evidence if received by the Court would in no way enable the Court to determine the constitutionality or unconstitutionality of the law in question. Our position is that this is purely a question of law and that the facts establishing the guilt of the defendant are already before the Court and that the Court in determining what is purely a question of law will not receive evidence regarding matters about which there is serious dispute. I must say in a case of this kind if we were trying it before a jury this evidence could not be received because the facts are admitted and the law is plain and no amount of testimony such as the defendants here seek to introduce would aid the Court in determining the law in order to instruct the jury. Are we to try a case like this, for instance, before a jury and have one decision to-day and if another case is brought to-morrow or next week and tried before another jury to have, perhaps, a different verdict? Such a proceeding as that would lead to endless confusion and in determining a question of this kind where the facts are undisputed before the Court no light will be thrown on the constitutionality of this law by admitting testimony that is at best a matter of scientific dispute. If, as I stated a moment ago, it was a matter of common knowledge the court would take judicial notice of it, but as it is not a matter of common knowledge the court can not go into it now in the determination of the law. I will not burden the court with numerous citations of authorities in support of the proposition but I would respectfully call the court's attention to the case of Ex Parte Renfro, Vol. 112,

page 591, Missouri State Reports. Of course I do not contend that this case is on all fours with the case I refer to but the case there is squarely in point and I think is decisive of questions of this kind. I also call the attention of the court to the case of State v. Rich in the 20th Missouri as being in point.

The Court: Have you with you the recent opinion of the United States Supreme Court in the Powell cases? I want to say in this connection that several years ago I was counsel in a case in which the suicide clause of the insurance laws of this state was involved, before the United States Circuit Court of Appeals for this circuit and it came before the court on the question of the validity of that clause as depriving a man of the right to contract. It was afterwards desired to take the case to the United States Supreme Court and the United States Supreme Court refused to entertain any proposition for a consideration of the case. I have been informed that since that time practically the same question was raised in an eastern state and the United States Supreme Court supported the contention we made before the United States Circuit Court of Appeals. I have not been able to find that decision but it seems to me it would have a very strong bearing upon the present case. It seems to me that the question that I am to decide is not so much the constitutionality or unconstitutionality of this act but as to the scope and effect of the act, or rather the limitation upon the scope and effect of the act.

Mr. Cunningham: There is another matter that I wish to call your attention to and that is the legislature must be presumed by the court to have considered all of these matters before enacting this law and it must have had knowledge of the fact that there was a dispute about these things and it is not now for this court to go into the question that the legislature itself is presumed to have gone into before the law was passed.

The Court: I think it would be best in a case of this kind that I should receive the evidence and when the evidence is all before the court then I can determine the matter. I do not want to deprive these gentlemen of their evidence if the supreme court should say they were entitled to the evidence and if this case goes before the Supreme Court the evidence will be before that body even though after I hear

it I should decide that it would be best to exclude it entirely. Of course you understand my position. In determining the proposition of law I am not prejudiced by this evidence one way or the other and if it is in the record the supreme court will have it before them in the bill of exceptions if this case goes up and therefore I will take the testimony subject to your objection.

Mr. Cunningham: Is it understood that when an objection is raised and a ruling made the exception is saved without stating every time that we except to the ruling of the court:

The court: It will be so understood. I will hear this testimony subject to your objection. To which action of the Court in ruling that it would hear the evidence only subject to the plaintiff's objection, the defendant then and there at the time duly excepted.

Mr. Seddon: Q. I believe you stated that you are familiar with the conditions of the baking powder trade throughout the United States and the State of Missouri? A. Yes, sir.

Q. That has been a part of your business has it A. Yes, sir; that has been my business.

Q. Where do you sell your goods A. All over the United states.

Q. Do you travel any in connection with your business? A. Yes, sir; I travel a great deal—most of the time in fact.

Q. Have you come in contact with the trade in its different phases? A. Yes, I come in contact with the trade all the time.

Q. Will you please state for the information of the Court what kind of baking powders are generally known in the trade? A. Well we have three different kinds or different classes of baking powders. We have what is known as straight cream of tartar powder, alum phosphate powder and straight alum goods.

Q. Now will you please explain to us to what extent this trade exists in the United States in these various kinds of baking powder? A. Why baking powder is an article in universal use throughout the United States.

Q. You say it is universally used? A. Yes, you

will find it for sale by every retail grocer I think in the State.

Mr. Cunningham: We object to the witness stating anything he does not know of his own knowledge. We object to those statements as evidence of facts.

Mr. Seddon: Some things we must prove by statements of the witnesses who are familiar with the subject. We can prove the existence of this trade throughout the State of Missouri and throughout the United States by those familiar with the trade.

The Court: You may show his familiarity with the trade.

Mr. Seddon: You say that baking powder is an article that is used universally throughout the State? A. Yes, I can say this I have never called upon a retail grocer during the last twelve or fifteen years who did not keep baking powder in stock. During that time I have covered the State of Missouri, portions of Illinois and Iowa and I never met up with a grocer who did not carry alum baking powder in stock.

Q. I will ask you if you manufacture baking powder as well as sell it? A. Yes, sir; I am engaged in the manufacture of baking powder.

Q. Do you know what concern manufactures and sells what is known as the Cream of Tartar baking powder in this country?

Objected to as immaterial and incompetent.

Objection sustained.

Defendant then and there excepted to the ruling of the Court at the time.

Q. What is baking powder used for? A. It is used for raising bread or lightening bread and other articles in cooking.

Q. Do you know the principle on which it works? A. Yes, sir.

Q. What is it? A. Well as I understand it when the powder is mixed with the flour and afterwards made into a dough and heat is applied carbonic acid gas is formed and when that gas is released it passes up through the mass of dough causing the bread to raise or lighten.

Q. It acts then in the same way as yeast? A. It produces the same result would be a better way of putting it.

Q. Baking powder is used as a substitute for yeast is it not in raising bread? A. Yes, sir; it is used as a substitute for yeast as it produces the same result.

Q. Although you say not exactly in the same way? A. That is right.

Q. What I mean is the object of both the yeast and the baking powder is to lighten the bread? A. Yes, sir.

Q. What is the object in having any substance in the bread to lighten it as you call it? A. If it did not have something in it to raise it or lighten it it would be heavy and indigestible. If you baked a mass of dough, that is flour mixed with water, without anything to lighten it it will be a very heavy indigestible mass and very unpalatable.

Q. Do you know the difference in composition between the cream of tartar baking powder and the alum baking powder? A. Yes, I know the difference.

Q. What is the difference in a general way? A. Well the difference in a general way is that in one case we use alum as the acid and in the other case we use the cream of tartar as the acid.

Q. What is the other element used in both cases? A. All baking powders contain bicarbonate of soda which is the alkali. The difference between the two being that in one case cream of tartar is used for the acid and in the other alum.

Q. Can you give some idea of the extent of the trade in alum baking powders in the United States?

Objected to as incompetent, immaterial and irrelevant.

Objection overruled.

To which ruling of the Court counsel for plaintiff then and there excepted at the time.

Mr. Cunningham: I wish the Court to understand that we are objecting to all of this line of testimony on the grounds stated in my formal objection made in the beginning of the taking of the testimony.

The Court: It is understood that all of this testimony is taken subject to your objection.

A. From the best information that I can get on the subject I should say the trade amounts to between ninety and one hundred and twenty millions of pounds of alum baking powders annually.

The Court: Throughout what territory?

A. Throughout the United States.

Mr. Seddon: How about the State of Missouri?

A. Well in the State of Missouri I should say that the annual production amounts to between seven and eight million pounds annually.

Q. Is there a large quantity of cream of tartar baking powder sold annually? A. Yes, sir; there is a large trade in cream of tartar powder.

Q. What is the origin of alum baking powder. When was it first used? A. I can not answer that question exactly. I only know that it has been in use ever since I have been in the business. I have known it for about twenty-two years, myself.

Q. You say you have known it for twenty-two years? A. Yes, sir; I have been engaged in the business more or less ever since I was a boy.

Q. According to your information has it been universally used during that period? A. Yes, sir; its use is very extensive and it is continually increasing.

Q. Where is your place of business? A. At 1000 Clark avenue, St. Louis, Missouri.

Q. Did you have any stock of goods on hand on the twentieth day of August, and if so to what extent?

Objected to as incompetent, immaterial and irrelevant.

Mr. Cunningham: The stipulation on file in this case admits that the baking powder which this defendant is accused of selling was manufactured after the 20th of August. I dont see how the amount he may have had on hand at that time can throw any light on this case.

The Court: I will sustain the objection.

To which ruling of the Court Counsel for defendant then and there excepted at the time.

Q. What amount of goods did you have on hand on the twentieth day of August, 1899, when this law went into effect.

Objected to as incompetent, immaterial and irrelevant.

Objection sustained.

Defendant then and there excepted to the ruling of the court at the time.

Q. Have you any idea of the amount of stock of alum powder on hand among the dealers and manufacturers in

the State of Missouri on the twentieth day of August, 1899, at the time this law went into effect?

Objected to as incompetent, immaterial and irrelevant.

Mr. Cunningham: I don't see how that can throw any light on this case. The stipulation is on file here showing that the powder was manufactured on the 28th day of August, 1899, and I do not see what effect the stock on hand could have in determining the issues in this case.

The Court: I will sustain the objection.

Defendant then and there excepted to the ruling of the Court at the time.

Q. Will you state the extent of your sales in alum baking powder yearly up to the time of the passage of this law?

Mr. Cunningham: I make the same general objection that I made to the introduction of any evidence and further if the Court should hold that these people are permitted to come in and show that alum powder is a harmless substance when used in this manner, the amount of his trade annually cuts no figure in determining that question.

The Court: I will sustain the objection.

To which ruling of the Court counsel for defendant then and there excepted at the time.

Q. Do you manufacture what is known as Layton's Quick Health Food? A. Yes, sir.

Q. I show you a tin can with a label on it and ask you whether or not you recognize it? (Witness shown a can.) A. Yes, I recognize it.

Mr. Seddon: The witness has just been shown a tin can marked 'exhibit "A" January 2, 1900, H. McW.' being an exhibit attached to the deposition of witnesses for the defendant taken in the City of New York.

Q. Will you please state to the Court what that can contains? A. That is a can of baking powder known as Layton's Quick Health Food manufactured by us.

Q. Is it universally put up in cans of that size with that kind of a label? A. Yes, sir.

Q. Is it made according to a formula? A. Yes, sir, according to a fixed formula?

Q. Is it all made in the same way? A. Yes, sir.

Q. And is manufactured here in St. Louis, Mo.? A. Yes, sir.

Q. Does it contain alum? A. Yes, sir.

Q. In what form is the alum which it contains? A. It is what is known as burnt alum, or soda alum, we call it.

Q. Do you know what aluminum sulphate is? A. Yes, sir.

Q. What is it? A. It is what is commonly known as alum.

Q. Is that the alum used in this powder? A. Yes, sir.

Q. What else is used in the manufacture of baking powder besides alum? A. Soda and corn starch.

Q. What do you mean by soda? A. Well the proper term is bicarbonate of soda.

Q. And you say this baking powder is composed of soda alum, corn starch and bicarbonate of soda in certain proportions? A. Yes, sir.

Q. In what proportions do you use bicarbonate of soda and soda alum? A. The proportions are about equal.

Mr. Cunningham:

By weight? A. Yes, sir; by weight.

Mr. Seddon:

Do you run that as a uniform brand? A. Yes, sir.

Q. And you sell it in the city of St. Louis? A. Yes, sir.

Q. And throughout the state of Missouri? A. Yes, sir.

Q. And throughout the United States? A. Yes, sir.

Q. This is your principal brand, is it? A. Yes, sir.

Q. Do you remember sending a package or box containing alum baking powder to Dr. Smith of New York? A. Yes, sir, I remember that fact.

Q. Do you recall the full name? A. Doctor Ernest Ellsworth Smith. I sent him two dozen cans and the can you showed me a while ago was one of the cans I sent him as I recognize it by an endorsement on the label showing the date to be October 27, 1899.

Q. That is the date the box was shipped to Dr. Smith? A. Yes, sir.

Q. How was it sent? A. It was sent by express.

Q. Is that the only lot you ever sent him? A. Yes, sir.

Q. Where did you get the baking powder you sent him? A. I took it out of our regular stock. It was stock that was manufactured for our trade.

Q. As I understand it the baking powder sent to Doctor Smith was the same kind that you supply to your trade? A. Yes, sir.

Q. And such as appears upon the shelves of the retail dealers wherever your goods are sold? A. Yes, sir; it is the same thing.

Q. How long have you been making that particular brand? A. About three or four years.

Q. Now about what proportion of this baking powder is intended to be used, say with a quart of flour?

Objected to as incompetent, immaterial and irrelevant.

Objection sustained.

Then and there the defendant's counsel excepted to the ruling of the court at the time.

The Court: I would like to ask you, Judge Seddon, if you contend that the proportion of baking powder used has anything to do with its healthfulness?

Mr. Seddon: I merely wanted to show how much is intended to be used as an ingredient in making bread. I will be able to prove that by other witnesses.

The Court: It may appear that in practice it is used in varying proportions. I do not see how his statement of proportions to be used will be material.

Mr. Cunningham: I make the further objection that it will appear that baking powder is in practice used by a cook who is not a chemist and his statement of the proportions would not always govern them in their work.

Mr. Seddon: You may state what if any complaint you have heard from people who have used your baking powder?

Objected to as incompetent, immaterial and irrelevant.

Objection overruled.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

A. I never heard any complaints whatever.

Q. You may state what complaints if any you have had from people using alum baking powder as to their unhealthfulness or injuriousness in the preparation of food?

Same objection.

The Court: He may state whether he has heard of any complaints.

Mr. Seddon: I will ask you if you have heard of any complaints being made by people who have bought and used your baking powder as to its unhealthfulness or injuriousness as an adjunct for food preparation?

Same objection.

The Court: Your question is now with reference to baking powders manufactured and sold by the defendant?

Mr. Seddon: Yes, sir; my present inquiry is.

The Court: The inquiry can be limited to that extent. The question here is that you are undertaking to prove whether or not these alum baking powders are injurious to health. You will of course confine yourself to that line of alum baking powder.

Mr. Seddon: I will put the question that way then: Have you ever heard of any complaint being made that alum baking powders such as are manufactured and sold by you are injurious or unhealthy when used in the preparation of food?

Same objection.

Objection overruled.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

A. I never heard of any complaints from anyone that our baking powder was unhealthy or injurious or in fact that any alum baking powder was unhealthy or injurious.

Q. Have you ever heard of any case of any person being injured or whose digestion has been disturbed by eating bread that was prepared with alum baking powder?

Same objection.

Objection overruled.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

A. I never heard of any such case.

Q. What has been your opportunities to learn of such cases if they existed? A. These complaints usually come back to the manufacturer through his customers and are always reported back as they expect to be compensated for any loss that they might sustain by reason of the quality of the goods. We are certain to hear of those things at once.

Q. Do you use alum baking podwer for cooking purposes in your own family?

Objected to as incompetent, immaterial and irrelevant.

Objection sustained.

Defendant's counsel then and there excepted to the ruling of the court at the time.

Q. Have you used alum baking powder in your own family, and if so please state what alum baking powder you have used?

Same objection.

Objection sustained.

Defendant's counsel then and there excepted to the ruling of the court at the time.

Q. If you have used alum baking powder in your own family will you please state what effect it has had upon the health and digestion of your family?

Same objection.

Objection sustained.

Defendant's counsel then and there excepted to the ruling of the court at the time.

Q. You are a married man? A. Yes, sir.

Q. How long have you been keeping house? A. Why, I haven't kept house but three or four years of our married life. As I have been traveling most of the time we have boarded.

Q. Where do you board? A. We board in a private family in the west end. Kingshighway and Cabanne avenue.

Q. In whose family are you boarding? A. The lady's name is Mrs. Farris. Mrs. Farris and her sister, Mrs. Bigelow.

Cross Examination.

By Mr. Cunningham:

Q. Do you mean to say that every grocer in the state of Missouri sells alum baking powder? A. I never called on one who did not. I have called on a large majority of them.

Q. Do you say that you have called on a large majority of the retail grocers throughout the state of Missouri. A. Yes, sir; I have.

Q. In person? A. Yes, sir.

Q. As I understand that answer it includes the largest towns throughout the State of Missouri as well as all sorts of towns throughout the interior? A. Yes, sir.

Q. And never in all of your experience have you found a single instance where they were not actually engaged in the selling of alum baking powder? A. Yes, sir. I don't think I have.

Q. Do you know you haven't found any who were not selling alum baking powder? A. No, I don't know of any that I have ever found who were not engaged in selling alum baking powder.

Q. Did you see the packages in these stores marked with alum on them? A. No, sir.

Q. Did you ever see the packages marked as indicating that they contained alum? A. Yes, sir. I have put them up that way myself.

Q. Is that a different brand that you make? A. No, sir; it is not a different brand but it is just marked that way.

Q. When did you do that? A. We have done that right along.

Q. They are not all so marked? A. No, sir.

Q. Those are special packages put up in that way? A. We have some trade that we supply that way.

Q. Not in this state. A. No, sir.

Q. What is it that you put on them? Just tell the court. I understood you to say that you have been using a uniform brand? A. We use a uniform brand in our business like the package that was shown me a moment ago. Some of them are marked—If you will let me have the can I can give you the exact words perhaps.

Q. Never mind that; give us your recollection? A. I do not remember the exact words but they are marked as indicating that they contain alum.

Q. Now in this can that you have here, which has been shown in evidence, is there any mention made of the fact on the outside that it contains alum? A. No, sir.

Q. Why is that? A. We only put that on when it is required.

Q. And not otherwise? No, sir.

Q. You only put it on where it is required you say? A. Yes, sir.

Q. And unless there is some requirement to that effect you never put it on? A. No, sir.

Q. Why don't you put it on even though it is not required if you are in the habit of putting it on some of your cans?

Objected to as being utterly incompetent and irrelevant.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. Do you put on your packages of baking powder that you sell in this state any statement that they contain alum?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. Did you ever use in this state any baking powder or have you ever sold any baking powder in this state containing alum that had a label on the outside of the package indicating that it contained alum?

Objected to as incompetent, immaterial and irrelevant.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. In what states is it you are required to put on your packages of baking powder a statement or an indication of the fact that they contain alum?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. Please state what alum baking powder besides that manufactured by you, you have seen that contained on the label of the package a statement of the fact that it contained alum, in this state or elsewhere—in this state first?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. Then out of the state?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

The Court: I will state, Major Cunningham, that I do not think that the manufacturers of alum baking powder in this state are compelled to label their packages that way and I do not see how that requirement in other states could affect this case.

Q. You stated in your direct examination that baking powders were divided into three classes, straight cream of tartar, straight alum and alum phosphate? A. Yes, sir.

Q. Which kind do you manufacture? A. We make the straight alum goods.

Q. Do you use any phosphate in them? A. No, sir.

Q. Then your baking powder contains sulphate of aluminum and bicarbonate of soda? A. Yes, sir.

Q. You used the term there soda alum didn't you? A. Yes, sir.

Q. What do you mean by that term? A. That is the name by which it is known in the trade—soda alum.

Q. What does the term soda alum mean? A. I don't think I could tell you exactly what it does mean. I am not a chemist.

Q. You do not profess to know anything about these details? A. No, sir.

Q. You know anything about chemistry? A. No, sir.

Q. You manufacture these goods you say? A. Yes, sir.

Q. How do you tell what proportion of the different ingredients are used in the preparing your baking powder? A. We get that from a people from whom we buy our material. They tell us what proportions to use of the material they supply. They are or generally have an expert chemist on that subject.

Q. Who are the people to whom you refer? A. We buy from the Hygienic Chemical Co. and also from the Pennsylvania Salt Manufacturing Company. We get most of our goods from the Hygenic Chemical Company.

Q. And they gave you the proper proportions for the different ingredients in your baking powder? A. Yes, sir.

Q. And you do as they say then? A. I do as they say.

Q. You do not know whether that is right or wrong then do you? A. If it works all right I take it as an indication that it is right.

Q. By that you mean if your goods give satisfaction you take it as an indication that your proportions are right? A. Yes, sir; as long as they give satisfaction we assume that the proportions we are using are right.

Q. And in ascertaining those proportions you are guided by what they tell you? A. Yes, sir.

Q. Then as I understand it you do not know of your own knowledge what the contents of your packages are—in what proportion the ingredients are used? A. Yes, sir; I do.

Q. What are the proportions? A. Roughly stated the proportions are one-fifth soda and one-fifth alum.

Q. Let me get that down; state that again? A. The proportions are one-fifth bicarbonate of soda and one-fifth soda alum.

Q. Anything else? A. Three-fifths starch.

Q. Are those the exact proportions? A. Not exactly, that gives a little excess of soda.

Q. One-fifth alum and one-fifth soda is that right? A. One-fifth gives a little excess of bicarbonate of soda.

Q. And three-fifths starch? A. Yes, sir; three-fifths starch.

Q. That gives about the proper proportion? A. Yes, sir.

Q. Where do you get the starch? A. From the National Starch Company and from the Chicago Sugar Refinery Company.

Q. Where do you get your bicarbonate of soda? A. We get that from three or four different places. We get some from the Michigan Alkali Works, some from the Pennsylvania Salt Manufacturing Company and some from Mathison & Co.

Q. Where do you get your alum? A. We get alum from the Pennsylvania Salt Manufacturing Company and from the Hygienic Chemical Company.

Q. I wish you would state how you proceed after you have the alum, bicarbonate of soda and the starch in your

establishment, when you undertake to make your baking powder? A. We put the ingredients, in the proportions given, in the mixer where they are thoroughly mixed together before being placed in the can.

Q. You do not do the mixing yourself? A. No, sir.

Q. You do not always oversee it? A. No, of course I am not always there but we have a man whose business it is to attend to those things.

Q. You do not know how it is done then? A. Yes sir; I know how it is done.

Q. How is it done? A. It is done in the manner I have described by putting the different ingredients in proper proportions in the mixer.

Q. How are these proportions ascertained? A. They are carefully weighed before being put into the mixing machine.

Q. What is done after they are put into the mixing machine? A. The machine is run from thirty to forty-five minutes so that the ingredients become thoroughly mixed.

Q. About how much in weight is put in the mixer at one time? A. Five hundred pounds of the mixture.

Q. How do you know that the alum you use is called soda alum, what I mean is: how do you know that it is sulphate of aluminum—a double sulphate of aluminum and sodium? A. I hardly know what you mean; we always call it soda alum.

Q. What I mean is, you do not know its chemical composition from my knowledge you have on the subject? A. No, only what I have been told.

Q. The people from whom you buy tell you that it is soda alum? A. Yes, sir.

Q. You know nothing about the chemical reaction which takes place do you? A. Well, yes, to this extent I know that if you pour water on a mixture of the soda and soda alum it will fizz.

Q. You don't know as a matter of fact whether the chemical reaction is complete do you? A. Not unless it is subjected to heat. It could hardly be complete without being heated.

Q. You say the process requires heating to complete the chemical reaction? A. Yes, sir.

Q. How much heat is required to complete that process —to complete the chemical reaction between the soda alum and the bicarbonate of soda?

Objected to on the ground that this witness is not a chemist.

Mr. Cunningham: He is engaged in the manufacture of an article that we claim is dangerous to public health and I want to find out what he knows about it.

The Court: The witness may state if he knows how much heat is required.

Q. I will let that go for the present. Do you know any thing about the present contents of that can, which was shown you? A. No, sir; I do not know anything about the contents of that can, except to say that it is a can containing baking powder, which was taken by me from our regular stock, and sent by me by express to Dr. Smith in New York.

Q. The can has never been opened since it was filled at your factory, has it? A. No, sir, it has not.

Q. So as to its contents, you have no personal knowledge? A. No, sir; except that I found it with the other cans in our regular stock, sealed up that way, and I sent it to Dr. Smith in order that he might have a sample taken from our regular run.

Q. What do you mean by that? A. I mean that the samples we sent him were taken from our regular stock, just as we make it up and send it out to our customers.

Q. As far as you know then, every can you send out, is identical in composition and quality with this can? A. Yes, sir; that is a specimen of our goods that we have manufactured year in and year out.

Q. What you mean to say then, is, that you did not manufacture this baking powder especially for the purpose of being analyzed by Dr. Smith, is that right? A. No, nothing of that kind was done. The idea was to give him a fair sample of the powder manufactured and sold by us, and for that purpose it was taken out of stock just the same as though it was intended to be sent to a regular customer.

Q. Now when you say this package is identical in composition with every other package manufactured and sold by you year in and year out, what is your authority for that statement, Mr. Layton? A. Simply from the fact that we

are extremely cautious in putting these goods together, and having ascertained the correct proportions, we never vary from that, as our goods have a reputation and we could not afford to do so.

Q. How long have you been using that formula? A. Practically ever since we have been in the business.

Q. Have you been using sodium alum ever since you have been engaged in the business? A. Before we used sodium alum, we used ammonia alum for a while.

Q. How long ago was that? A. That was about five years ago.

Q. As I understand it, you do not profess to know anything about the composition of sodium alum or ammonia alum? A. No, sir.

Q. I understood you to say that all you know about it is, that you are instructed by the parties from whom you purchased these goods, that certain proportions of each should be used in the manufacture of baking powder, and you have accordingly followed their directions? A. Yes, sir; that is about right.

Q. Now, you have stated in answer to Judge Seddon's question that you have never heard any complaints from people using your goods, to the effect that the use of your baking powder had made them sick or injured their digestion. A. Yes, sir; we never had any such complaints.

Q. Did you ever invite statements from any of your customers, or from any of the users of your goods, as to whether or not they had been sick on account of using them? A. No, sir; I never invited any such statements of that kind; if our goods go out and do not cause any complaint, it is a reasonable assurance to us that they are giving satisfaction. I am well assured that if anything was wrong we would hear from it without delay.

At this stage of the trial, a recess was taken until 2 o'clock this p. m.

At 2 o'clock p. m. Court convened, and further proceedings were had as follows:

W. J. KUPPER, a witness of lawful age, being called and sworn, testified on the part of the defendant, as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. William J. Kupper.

Q. Where do you reside, Mr. Kupper? A. I reside at Kansas City, Missouri.

Q. What is your occupation? A. I am manager of a hotel.

Q. What hotel? A. Of the Brunswick and Cordova hotels.

Q. Where are those hotels located? A. In Kansas City, Missouri.

Q. Do you have a large patronage? A. Yes, sir.

Q. What is the character of your patronage, as to being permanent or transient? A. Our patronage is nearly all permanent. We do very little transient business.

Q. Is it what you call a family hotel? A. Yes, sir.

Q. I will ask you if in the preparation of the food used in your hotel, you use any baking powders? A. Yes, sir.

Q. Will you please state to the Court what kind of baking powder you use? A. We have been using for some time past, what is known as "K. C. Baking Powder."

Q. What complaints, if any, have you heard from any of your boarders with reference to the injuriousness of the baking powder used by you in a preparation of food used in your hotel?

Mr. Cunningham: I object to that question on the ground that it does not appear that the K. C. Baking Powder used by this witness in the preparation of feed in his hotel, is what we call here an alum baking powder, for all the evidence here shows it may be another type of a baking powder, entirely.

This objection is in addition to the general objection I have made to any testimony heretofore.

Mr. Seddon: Of course we can't prove everything at once, but we will show by the other witnesses that the powder known as the K. C. baking powder, used by this witness, is an alum baking powder of the same type as the Layton baking powder, which defendant is charged with making.

The Court: With that statement from Judge Seddon, I will permit the witness to answer the question. Of course you understand, Major Cunningham, this testimony is all

taken subject to your general objection. To which ruling the defendant then and there duly excepted.

Major Cunningham: I so understand it, but I wanted to put in these additional objections from time to time, where the occasion arises.

Mr. Seddon: Q. Now, I will ask you, Mr. Kupper, to state what complaints, if any, you have had from your boarders as to the injuriousness or unhealthfulness of the food prepared for them with this K. C. Baking Powder? A. I have never had any complaints whatever from any of my boarders on that account.

Q. What complaints have you had from your boarders, or any other persons living at your hotel, as to the unhealthfulness or injuriousness of the food stuffs prepared with the K. C. Baking Powder, as injuring the digestion of the persons using it? A. I have never had any complaints whatever, on that score from any person.

Q. How long have you been keeping these hotels? A. One of them I have had eight years and the other three years.

Q. What satisfaction has the food given which was prepared with this K. C. Baking Powder? A. It has always given the very best satisfaction. I will state if it did not, and there was any complaint whatever, I would certainly be obliged, as a business proposition, to make a change in that regard.

Q. As I understand this matter, you used the K. C. Baking Powder regularly in your establishment, in the preparation of articles of food, such as bread and cakes and things of that kind? A. Yes, sir.

Q. And during all of this time you have never had any complaints that any person had had their digestion injured or their health impaired by using the food prepared from this powder? A. No, sir; never the least complaint, on the contrary, everything has been satisfactory.

Cross Examination.

By Mr. Cunningham:

Q. Were your boarders advised that the baking powder with which you prepared their food, contained alum? A. No, sir.

Q. Were they advised as to the particular brand of baking powder with which their food was prepared? A. No, sir.

Q. And you say that you did not advise them that the brand of baking powder you used in preparing their food contained alum? A. No, sir; I didn't advise them as to that.

Q. How long have you been using that baking powder? A. A little over eight years.

Q. Can you give us the price that you paid for that baking powder? A. I think it is about 9 cents a pound.

Q. Don't you know then, as a matter of fact that it could not be anything but an alum baking powder?

Objected to as incompetent. Question withdrawn.

GEORGE C. REW, a witness of lawful age, being called and sworn, testified on the part of the defendant as follows:

Direct Examination.

My Mr. Seddon:

Q. State your name? A. George C. Rew.

Q. Where do you reside, Mr. Rew? A. Chicago, Ill.

Q. What business are you engaged in? A. I am engagd in the manufacture of baking powder.

Q. What particular concern are you connected with? A. The Calumet Baking Powder Company.

Q. What particular brand of baking powder does your concern make? A. We make what is known as the Calumet brand.

Q. How long have you been engaged in that business? A. About eight years.

Q. Have you given the history of the baking powder and its present trade conditions any study? A. Yes, sir; I have given it considerable attention.

Q. Have you in your line of business qualified yourself with reference to those matters? A. Yes, sir.

Q. Your company, you say is the Calumet Baking Powder Company? A. Yes, sir.

Q. Does that company do a large business? A. Yes,

sir; we do a very extensive business.

Q. In that connection, I will ask you what kind of baking powder you manufacture? A. The Calumet brand of baking powder.

Q. I meant as to whether it was an alum powder or not? A. Yes, sir; it is an alum powder.

The Court: When you use the term "alum powder," you mean it is a baking powder in which alum is one of the ingredients? A. Yes, sir; I use that term in the trade sense. We speak of the alum powders and the cream of tartar powders, meaning by an alum powder, a baking powder that contains alum.

Mr. Seddon: I will ask you what classes of baking powders we have in this country—how are they classified?

A. Well, you always make four classes of baking powder, although generally speaking, you might confine yourself to three classes.

Q. Will you please enumerate the four classes known to you? A. The first class is what is known as the cream of tartar powder, being composed of bi-carbonate of soda, cream of tartar, tartaric acid and starch. That includes all of what we call the cream of tartar powders. Then we have what we call the alum powders which are composed of alum, bi-carbonate of soda and starch. We have the alum phosphate powders, which are composed of alum phosphate, bi-carbonate of soda and starch, and then what we call the phosphate powders, being composed of phosphate of lime, soda and starch.

Q. Is the phosphate powder manufactured to any limited extent? A. No, sir; that class is only manufactured to a limited extent, because the powder is not a good keeper, that is to say if put up for any length of time it looses its virtues as a baking powder, the substances combining in the powder and neutralizing each other before used, so that if kept any length of time, the powder is practically of no value.

Q. Of the three kinds of powders you have mentioned as being manufactured extensively then, you have the cream of tartar powder, the straight alum powder and the alum phosphate powder? A. Yes, sir.

Q. Both the alum and the alum phosphate powders

being known under the trade name of alum powders? A. Yes, sir.

Q. How do you distinguish them in the trade? A. We generally speak of them as straight alum baking powder and alum phosphate baking powder.

Q. Which is the straight alum powder? A. That is an alum baking powder made of bi-carbonate of soda, burnt alum and starch.

Q. Now how long has the cream of tartar baking powder been manufactured and sold on the market. I do not expect you to give the exact time, but state approximately? A. Of course I have no personal recollection of time, but I can state that I am informed that it has been on the market for about 40 years.

Q. As I undertand it, the cream of tartar baking powder has been a commercial article of importance for about 40 years? A. Yes, sir.

Q. What can you say about the alum baking powder. How long has that been an important commercial article? A. For at least 25 or 30 years.

Q. Now, will you state whether or not, during that time, it has increased in importance as a commercial article, or has decreased? A. From a very small beginning, 25 or 30 years ago, the trade in alum baking powder has grown to an enormous proportion, and is increasing every year.

Q. Now, will you state to what extent the alum baking powder is manufactured in this country. Give as near as you can the number of pounds manufactured annually? A. It is a matter of common knowledge among baking powder manufacturers who produce alum powders that there is consumed annually in the U. S., about twenty million pounds of burnt alum for the purpose of making alum baking powder. On the basis of about twenty per cent of burnt alum in baking powder, twenty million pounds of burnt alum used for baking powder purposes would mean an annual output of about one hundred million pounds.

Q. As I understand it, based on an estimate of twenty million pounds of burnt alum consumed annually for that purpose you estimate a hundred million pounds of the finished product—alum baking powder, annually? A. Yes sir.

Q. What is the average price per pound of the alum baking powder? A. Some brands of alum baking powder

retail for 25 cts. and some as low as 10 cts. per pound. I would put the average at say, about 15 cts.

Q. Now I will ask you how the price of alum baking powder compares with the price of cream of tartar baking powder?

Objected to as immaterial:

Mr. Seddon: We propose to show that these different baking powders have come in competition with each other for a number of years, and that there is a wide range in price between the two articles, and I think it is very material that we should be permitted to show the relative price of these two substances.

Mr. Cunningham: I will withdraw the objection then.

Q. Please state if you know the retail price of the cream of tartar baking powders? A. They retail from 45 cts. to 50 cts. per pound.

Q. I will ask you if you are an expert chemist? A. I have a chemical education.

Q. Have you pursued the study of chemistry since you have completed your education at school? A. I have only so far as it applies to baking powder.

Q. Were you not associated or assistant to some one as a chemist? A. Well, I graduated from the University of Michigan, and the last two years that I was in school I was the assistant to the professor in general chemistry, as a student.

Q. Are you familiar with what is known as the formula of alum baking powders? A. Yes, sir.

Q. What is the formula? A. Well, I think the formula that Mr. Layton gave when he was on the stand would be typical of his class of goods.

Q. These formulas will differ somewhat, will they not? A. Yes, sir; the main thing of course is to produce a powder that will have a great deal of leavening gas when it is used. In other words, a strong powder.

The Court: What do you mean by the term strong as applied to these baking powders?

A. The strength of course is measured by the amount of leavening gas given off, and if a pound of one kind of baking powder will produce more leavening gas than a pound of another the first is said to be the strongest. The object is always to get a powder that will produce a large amount of leavening gas.

Mr. Seddon: And you say the formula given by Mr. Layton, is typical of his class of goods? A. Yes, sir.

Q. About 20 per cent of burnt alum 20 per cent of bi-carbonate of soda, and the balance of starch? A. Yes, sir; 20 per cent of burnt alum, 20 per cent of bi-carbonate of soda and starch to a hundred—making about 60 per cent starch. These figures will vary somewhat in practice, but that is about the formula—those are about the proportion.

Q. What kind of alum is used in the manufacture of alum baking powder, at the present time? A. I think sodium alum is more largely used than any other at the present time, in fact it is so generally used that I might say its use for that purpose is now almost universal.

Q. You say that in times past, other kinds of alums have been used, but nearly all the alum now used for baking powder purposes is sodium alum? A. Yes, sir; sodium alum is now almost universally used.

Q. How many kinds of alum were ever used in this business for manufacturing baking powder? A. I never heard of any used for that purpose, but sodium, ammonia alum and potassium alum.

Q. And of these three forms, sodium is most used at present for baking powder purposes? A. Yes, sir; those others were formerly used, but not so much at the present time.

Q. Are you familiar with the preparation of cream of tartar baking powder? A. Yes, sir.

Objected to as incompetent, immaterial and irrelevant.

Mr. Seddon: We want to show the relation of the two different baking powders to each other in the trade, as it exists at the present time.

The Court: I will overrule the objection.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

A. The best cream of tartar baking powder contained from 25 to 28 per cent of bi-carbonate of soda; 5 to 10 per cent of tartaric acid, and the balance cream of tartar and starch to one hundred.

Q. Do you know what is the reaction that takes place in alum baking powder when mixed with flour and made into a dough, in the process of cooking? A. The reaction between the alum and the bi-carbonate of soda produces carbonic

acid gas or carbon dioxide, which is driven off, and passing up through the mass of dough, leavens it or lightens it. That is the object for which the powder is used in making bread or other articles of fod.

Q. The production of carbonic dioxide or carbonic acid gas is the sole pupose for which baking powder is used in the process of preparing food stuffs? A. Yes sir; it has no other object whatever.

Q. Now will you please explain how it works and what effect it has in the process of baking? A. The alum and the bi-carbonate of soda in the baking powder unite when mixed with the flour and water, in making the dough, and in the process of baking when heat is applied, the carbon dioxide is driven off. As I stated a moment ago, the gas rising through the mass of dough puffs it up or leavens it or lightens it. If it were not for the gas passing up this way, the bread would be heavy and flat and almost indigestible.

Q. The sole object, you stated a moment ago, being to generate a gas that will pass up through the mass of dough, and puff it up or lighten it? A. Yes, sir; that is the object.

Q. Now then after that reastion has taken place, and the carbon dioxide has been driven off, what, if anything, is left in the bread? A. You have a very small quantity of aluminum hydrate and sodium sulphate.

Q. What is sodium sulphate? A. It is Glauber's Salts.

Q. Have you made any analysis of alum baking powder to find what the reaction is and what the particular result is? A. I have made an analysis principally for the purpose of determining whether or not there was any soluble aluminum compounds left in the bread after the process of baking.

Q. What did you find in regard to the presence of any soluble aluminum compound? A. I found that there were no soluble aluminum compound in the bread after it was baked.

Q. Is alum a soluble compound? A. It is soluble in water.

Q. Now then after the bread was baked with this baking powder, was there present any free alum in the bread? A. I stated a moment ago that there was not. Free alum is a soluble aluminum compound, and as I did not find any soluble aluminum compounds present in the bread as it was

baked, it follows that there was no free alum present.

Q. Did I ask you whether or not alum is a soluble compound? A. You asked that question a moment ago, and I answered that alum is a soluble aluminum compound.

Q. And when you made your analysis, if there had been any free alum present, you say you could have detected it? A. Yes, sir.

Q. In other words, if there had been any free alum present, it would have been soluble in the water? A. Yes, sir.

The Court: What, if any, trace of free alum did you discover in the bread? A. I was unable to discover even a trace.

The Court: What, if any, trace of free alum did you discover in the bread?

A. I was unable to discover even a trace.

Mr. Seddon: Do you know what kind of alum baking powder is used by Mr. Ross of the Chicago Beach Hotel? A. He uses the Calumet Baking Powder manufactured by us.

Q. That is the baking powder manufactured by your concern, is it? A. Yes, sir.

Q. Has that baking powder alum in it? A. Yes, sir.

Q. What are the constituent elements of that Calumet Baking Powder? A. It contains alum, soda, and starch to one hundred.

Q. What is the object of starch that is used in making baking powder? A. It is used as a "Filler," the object being to keep the soda and alum from uniting and neutralizing each other in the can. If they were put in the can alone, there is great danger that they would neutralize each other, and the powder would be worthless when you come to use it, because the greater part of the carbon dioxide would be driven off, as it is, the starch prevents this union or in other words, keeps them separate until they are used in the process of baking then the chemical reaction takes place and the carbon dioxide is formed.

Q. So that the starch really takes no part in the process of forming the gas? A. No, sir; none whatever. As I stated a moment ago, it is merely put in there as a "filler."

Q. Now, you have given us the chemical reaction that took place and the resulting products in a case of bread made with alum baking powder, will you now give us the

chemical reaction that takes place and the resulting products in the case of bread made with cream of tartar baking powder?

Objected to as incompetent for any purpose whatever.

The Court: I will overrule the objection.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

The Court: Have you made any examination on the subject? A. Yes, sir.

Mr. Seddon: State what takes place when cream of tartar is used in baking powder instead of alum? A. A chemical reaction takes place. Carbon dioxide is driven off, and the residue is what we call Rochelle Salts.

Q. What are Rochelle Salts used for? A. Rochelle Salts is the principal ingredient of seidlitz powders. It is the active element in seidlitz powders, and in common terms, I may say it is a purgative.

Q. It is practically the same stuff that we use in seidlitz powders, is it not? A. Yes, sir; it is the same substance.

Q. Now Mr. Rew, Mr. Kupper of Kansas City testified that he used in his hotel what is known as the K. C. Baking Powder. You heard his testimony, did you not? A. Yes, sir.

Q. Are you familiar with that brand known as the K. C. Baking Powder? A. Yes, sir.

Q. Are you able to state whether or not, of your own knowledge, it contains alum? A. Yes, sir, it contains alum.

Q. To what particular class of baking powders then, does it belong? A. It belongs to what we term alum phosphate powders.

Q. Now Mr. Rew, you say you have been engaged in the business of manufacturing and selling baking powder for a number of years? A. Yes, sir.

Q. And you have familiarized yourself with the trade? A. Yes, sir.

Q. Your company does a large business I understand? A. Yes, sir.

Q. Now I will ask you what complaints, if any, you have ever heard with reference to the unhealthfulness or injuriousness of your baking powder?

Objected to as incompetent, immaterial and irrelevant.

Objection overruled.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

A. We have never heard any complaint of that character.

Q. During the entire period of time you have been engaged in the manufacture of alum baking powder? A. No, sir; I have yet the first complaint to hear of that character.

Q. What complaint, if any, have you heard with reference to the injurious effect that this alum baking powder has upon the digestion of people who use food prepared with alum baking powder? A. I have heard no complaint of that kind, whatever.

Q. Has any complaint of that character developed in your trade? A. No, sir; never.

Q. I will ask you to state whether or not alum baking powder has been universally accepted as a useful and wholesome adjunct in the preparation of food in the household—as far as your trade knowledge goes?

Mr. Cunningham: I do not see how this witness is able to testify what is universally used. There must be some limit to his knowledge on the subject.

Mr. Seddon: He said he had been in business many years, and was acquainted with the trade.

The Court: He can only state as far as his knowledge goes as far as his trade knowledge goes, he may state whether or not it had been accepted as a useful and wholesome adjunct in the preparation of food stuffs. I will overrule the objection.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

A. Yes it has been generally accepted as a useful and wholesome adjunct in the preparation of food in the household.

Mr. Cunningham: Did you use the word universal there? A. Yes, sir; it has been generally accepted. The word universal I think would be better. The sales of alum baking powder are simply enormous and are increasing every year, so that I think the word universal might be very properly used in that connection.

Mr. Seddon: In that connection, I will ask you what is the extent of the business of your company. I do not want

the exact figures, but I would like you to state in a general way, over what territory your business extends, and whether or not it is an extensive business? A. Yes, sir; we have a very extensive trade throughout the west, extending even to western Pennsylvania. I may say it covers everything from western Pennsylvania to the Pacific coast.

Q. Then you cover nearly the whole country? A. Yes, sir; everything except the Atlantic coast.

Q. I will get you to state whether or not your trade in baking powder would be considered a large trade? A. Yes, sir; it would be considered a very large trade.

The Court: Can you state approximately, in pounds, what you manufacture? A. Well I would rather not give that, but I will state that we keep right close after the trade, and do a very large business.

Cross Examination.

By Mr. Cunningham:

Q. What is the name of the concern with which you are connected? A. It is the Calumet Baking Powder Company, an Illinois corporation.

Q. What are the names of the baking powders manufactured and sold by your concern? A. The Calumet Baking Powder is the only one.

Q. Then you do not make and sell the K. C. Baking Powder, which was spoken of by Mr. Kupper? A. No, sir; we do not.

Q. Do you know anything about the K. C. Baking Powder? A. Yes; it is an alum baking powder.

Q. How do you know that, Mr. Rew? A. Because I examined it to find out.

Q. What tests did you apply to give that result? A. I analyzed it.

Q. Did you find alum present? A. Yes, sir.

Q. Did you determine how much of these constituents were in this powder? A. No, sir.

Q. You are now speaking about the analysis of the K. C. powder? A. Yes, sir.

Q. Are you a skilled chemist? A. I do not pretend to be a chemical expert, but I have had a chemical education,

and since leaving school, I have applied myself solely to chemistry as applied to baking powder.

Q. You do not pretend to be up then in general chemeral chemistry as a scientific expert? A. No, sir.

Q. Your experience in school was confined to such experience as is usually gained in schools of that kind? A. Yes, sir.

Q. And since then you have applied yourself solely to chemistry as applied to baking powders? A. Yes, sir.

Q. You say that your general knowledge of chemistry is only that which was gained by you at school? A. Yes; I am a graduate of the university of Michigan and took my degree, but since that time I have devoted myself solely to the chemistry of baking powder.

Q. Who were your instructors in chemistry there? A. Your chief witness was one, and Dr. Prescott was another.

Q. How do you know he is my chief witness? A. I refer to the gentleman sitting by your side.

Q. How do you know he is my chief witness? A. I will withdraw that answer because it is a long story.

Q. You have stated that the Calumet baking powder is a powder manufactured by your concern and contains alum? A. Yes, sir.

Q. Is there anything on the label or package in which your powder is put up, indicating that it contained alum?

Objected to as incompetent for any purpose:

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

Q. Do you take any pains to notify the purchasers of your powder that it contains alum?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted the ruling of the Court at the time.

Q. Do you know of any baking powder that is sold in the market, that has upon the label a notice to the effect that it contains alum?

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted the ruling of the Court at the time.

Q. Now you have stated that what you call cream of tartar baking powder is sold in the market from 45 cts. to 50 cts. per pound? A. Yes, sir.

Q. And you have stated that alum baking powder is sold in the market at prices ranging from 10 cts. to 25 cts. per pound, averaging 15 cts. per pound? A. Yes sir.

Q. What is the reason why the cream of tartar sells at 45 cts. per pound and the alum powder at 15 cts. per pound?

Objected to as irrlevant.

Objection overruled.

Defendant's counsel then and there excepted the ruling of the Court at the time.

A. The cream of tartar baking powder is made of material that costs more than the materials used in making the alum baking powder.

Q. How do you know that? A. I am familiar enough with the cream of tartar market to know that it costs a great deal more than the alum.

Q. Do you know what the alum costs per pound? A. Yes, sir.

Q. Well how much? A. From 3 3-4 cts. to 4 3-4 cts. per pound.

Q. What is the price of the alum purchased by your concern, in its business?

Objected to as incompetent.

Objection sustained.

Defendant's counsel excepted then and there to the ruling of the court at the time.

The Court: I do not think it is proper to ask this witness what price he pays for the alum they use in their business. He may state, however, if he knows the market price of the alum.

Q. I will ask you if it is not a fact that alum sells as low as 1 1 1-2 cents a pound that you use in your business?

Same objection.

The Court: As I stated before, he may testify what he knows as to the market price of alum, but he need not state what his concern is paying for it.

Mr. Cunningham: Q. Do you know of your own knowledge, as to the fact that baking powder manufacturers are now paying from 1 cent to 1 1-2 cents per pound for the alum used by them in the manufacture to baking powder?

Objected to as incompetent.

Objection sustained.

Defendant's counsel then and there excepted to the ruling of the Court at the time.

The Court: He must confine himself to the market price, if he knows the market quotations he must state them.

A. I do not know right now just what the market quotations are.

Q. Do you know it is over 1 1-2 cents per pound? A. Yes, sir; it is more than that.

Q. How much more? A. You are now talking about wholesale quotations?

Q. Yes? A. You mean soda alum, or burnt alum or what kind of alum?

Q. Take burnt alum? A. Well burnt alum never sold in the market for less than 3 cts. per pound.

Q. Not at any time? A. No, sir.

Q. What is the present quotation for cream of tartar. The present wholesale price? A. That I am not competent to say. I stated that I knew in a general way that cream of tartar is much more expensive than alum.

Q. How do you know that? A. Because I know that as a matter of general information in the market, and I have often seen quotations.

Q. Give us some figures that you have seen quoted as to the market price of cream of tartar? A. It would be a guess at best, with me.

Q. Give us the best you can recollect? A. I have seen 19c quoted as the wholesale price.

Q. Now, will you tell us why a consumer prefers to pay from 45c to 50c per pound for cream of tartar baking powder, when they can get an alum powder for 15c per pound, that you say is just as good? A. They are doing it right along.

Q. How can any one manage to sell baking powder at 45c to 50c per pound, when, according to your statement, there is something on the market equally as good for 15c per pound? A. Well, as a matter of fact they sell a great deal more alum baking powder than they sell of cream of tartar baking powder.

Q. Now, I will put the question this way, is the cream of tartar baking powder sold at all? A. Yes, sir.

Q. And you say at a price ranging from 45c to 50c per pound? A. Yes, sir.

Q. And you say the alum baking powder is also sold at a price averaging 15c per pound? A. Yes, sir.

Q. And they are sold side by side in the market right along? A. Yes, sir.

Q. And one you claim, is just as good as the other? A. Yes, sir.

Q. Well, now will you tell me why it is that any person would pay 45c or 50c for a baking powder, when they could get something equally as good for 15c per pound? A. I can not explain it on any other theory than that some people will drink champaign when they can get get beer.

Q. You can not give any other reason? A. No, sir; I think that is about the situation.

Q. You say you are familiar with alum baking powder? A. Yes, sir.

Q. And that the formula given by Mr. Layton represents the type of baking powder manufactured by a large number of manufacturers of so called alum baking powder? A. Yes, sir.

Q. Now, do the manufacturers use one formula? A. No, sir; each manufacturer has his own formula, but the general preparations are about as Mr. Layton stated them.

Q. And you say each manufacturer has his own formula? A. Yes, sir.

Q. Do the manufacturers determine the formula they use or how is that matter determined? A. Some perhaps do but I would say that I think in most cases the formula is determined by the manufacturers who furnish the raw material. The manufacturing chemists furnish the raw material and they generally give the manufacturer of baking powder the formula to work by. They are fully competent to do it.

Q. Who furnished you with the formula which you use? A. I worked it out myself together with information received from the sources I have just mentioned.

Q. What do you mean by saying that some of these alum baking powders are stronger than others? A. I mean by that that they contain more available leavening gas.

Q. You mean by that they will evolve more carbonic acid gas? A. Yes, sir.

Q. Then they have more carbonate of soda? A. Necessarily to produce more carbonic acid gas.

Q. Have they any more bicarbonate of soda than will be decomposed by the alum? A. There should not be any more.

Q. What would the result be if more bicarbonate of soda was used than the alum would decompose? A. A little free soda would be left in the bread which would be slightly alkaline.

Q. Is that pleasant to the taste? A. I never saw any containing an excess of bicarbonate of soda sufficient to taste in the bread.

Q. Would an excess of soda have any effect on the color of the bread? A. It would have to be largely in excess. I never saw any baking powder in which there was such an excess that it would taste or discolor the bread.

Q. How would soda discolor the bread? A. If there was sufficient excess of free soda left in the bread it would give the bread a bitter, unpleasant taste, and it would give it a yellowish appearance such as is often seen in the old fashioned soda biscuit.

Q. When you speak of the difference in strength of the different brands of baking powder do you mean the relative amount of alum or the relative amount of bicarbonate of soda? A. I refer to the gas entirely.

Q. Bicarbonate of soda furnishes the gas does it not? A. When decomposed by the alum it furnishes the gas.

Q. What is the result? A. The alum neutralizes the bicarbonate of soda.

Q. If you did not put in enough bicarbonate of soda what would be the result? A. The result would be that free alum would be left in the bread.

The witness: Can I make a speech on that point?

Mr. Cunningham: Not at present.

Judge Seddon: If you have any explanations to make you may make them.

A. I merely wanted to say that there would never be an excess of alum put into baking power for commercial reasons. If a man wanted to put in anything in excess he would certainly put in more starch. Starch is much cheaper than either the alum or soda and therefore if he wanted to put something in to reduce the cost so that his profit might

be greater he certainly never would use alum because it costs about three times as much as the starch. That is what I mean when I say that for commercial reasons they never would put in such a quantity of alum that there would be any free alum left in the bread. Business instinct would show them at once that they were working against their own interests.

Mr. Seddon: It is commercial conditions then that regulate that matter? A. Yes, sir.

Q. And for the reasons you have stated no more alum would be used than was absolutely necessary to decompose the soda? A. That is correct.

Q. Now I understand you to say that you tested the powder that was made by the K. C. Baking Powder Co. or the K. C. Baking Powder? A. Yes, sir.

Q. Did you analyze the bread that was made with K. C. baking powder? A. No, sir; I did not analyze the bread made with K. C. baking powder. I merely analyzed the powder to determine its constitutent elements. I will say that I have tested bread made with alum baking powder.

Q. What particular brand of baking powder was used in making the bread on which you made your test? A. I used the Calumet baking powder.

Q. That is your own brand? A. Yes, sir.

Q. You stated that you did not find in the bread any soluble aluminum compound? A. I found no aluminum compound soluble in water.

Q. You didn't find any free alum? A. No sir.

Q. What did you find? A. I found an aluminum hydrate and a sodium sulphate.

Q. You say you were looking for soluble aluminum compounds? A. Yes sir; I was looking for aluminum compounds that were soluble.

Q. Aluminum compounds soluble in what? A. Aluminum compounds soluble in water.

Q. How did you make the test in order to determine those matters? A. In the first place after the loaf had been baked it was chopped fine and digested in distilled water. I afterward used a dialyzed tube to separate any organic matter that might be present and then after it was allowed to stand until it was thoroughly digested the aqueous extract was filtered off and then tested for alum and if there had been

any free alum present in the mixture I could have detected it. I could not even find a trace.

Q. Do you state that as a positive fact? A. Yes, sir.

Q. Now, then, if I understand you, Mr. Rew, if the alum was there and was not soluble in water then it would not have been detected by your test? A. I never saw any alum that was not soluble in water.

Q. Why do you make that qualification?

(No answer was given to this question.)

Q. You have not answered my question? A. No, sir.

Q. Do you know what the secretions of the stomach are? A. I am not a physiologist.

Q. Will you please answer my question? A. I am not prepared to go into that question now.

Q. Will you please answer my question, Mr. Rew? A. The gastric juices of the stomach?

Q. Yes. A. The gastric juices are secreted by the stomach.

Q. Do you know whether any of the aluminum compounds are soluble in the gastric juices of the stomach that are insoluble in water? A. I do not know.

GEORGE B. ROSS, a witness of lawful age being called and sworn testified on the part of defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. George B. Ross.

Q. What is your business? A. I am a hotel manager.

Q. What hotel do you manage? A. I manage the Chicago Beach Hotel at Chicago, Ill.

Q. How long have you been engaged as manager of the Chicago Beach Hotel? A. I have been there four years.

Q. What kind of a hotel is the Chicago Beach Hotel, as to the amount of business that is done and the character

of the patrons, whether transient or permanent? A. Well, with the exception of the four summer months most of the guests are Chicago people and are permanent guests. During the summer months of June, July and August we have a very great number of transients, more in proportion than our permanent guests.

Q. You say that for about eight months in the year the guests are nearly all permanent? A. Yes, sir.

Q. Does the hotel do a large business? A. Yes, sir.

Q. About what is the extent of the business as regards the number of guests that you entertain there? A. Our guests will number as high as three hundred and eighty during the winter months and we have had as many as five hundred and ten in the summer months. Five hunded and ten is the highest number we have had.

Q. You state that most of the guests in winter are there permanently? A. Yes, sir; almost all of them.

Q. Do you use any baking powder in the preparation of food in that hotel? A. Yes, sir.

Q. What kind of baking powder do you use? A. We use the Calumet baking powder.

Q. You do not know of your own knowledge whether that is an alum or cream of tartar baking powder, do you? A. I only know what I have been told. Of course I never made an analysis of it.

Q. You heard Mr. Rew, one of the manufacturers of that baking powder testify that it was an alum powder did you not? A. Yes, sir.

Q. Have you observed any injurious effects upon your guests caused by the use of that baking powder in the preparation of food? A. No, sir.

Q. Have you used any other baking powders than the Calumet in your establishment? A. No, sir; not since I have been there.

Q. How long did you say you have been using it? A. I went there in 1896, the spring of 1896, and they were using it then and we have continued to use it exclusively since that time.

Q. Have you heard any complaints from your guests that they have suffered any injurious effects from the use of food prepared with that baking powder? A. No, sir; I never had any complaints of that kind.

Q. Do you use it yourself? A. Why, yes; I eat the bread and other food prepared with it.

Q. You are a man of good health? A. Yes, sir; most excellent health.

Q. You are a man of family? A. Yes, sir.

Q. What is the health of your family? A. Good.

Q. How much of a family have you? A. Just my wife.

Q. Have you ever experienced any ill effects upon your digestion from using food prepared with this baking powder? A. No, sir.

Q. Both yourself and wife enjoy excellent health? A. Yes, sir.

Q. And you say you have not received any complaint from your guests on account of the ill effects they have experienced from the use of food prepared with the Calumet baking powder? A. No, sir; I have never had any complaint whatever on that score.

Cross Examination.

By Mr. Cunningham:

Q. When did you first begin using the Calumet baking powder? A. They were using it when I went there and we have continued its use ever since.

Q. When did you for the first time learn that Calumet baking powder contained alum? A. I can not say.

Q. Do you know that fact of your own knowledge now? A. No, sir; only what I have been told.

Q. Did you ever hear it before Mr. Rew testified here to-day? A. Well, certainly; I never gave the matter very much consideration but it was always associated in my mind as being an alum powder for the reason that the price would indicate that. I do not know what the other ingredients are but I know in a general way that alum baking powders are much cheaper than what they call the cream of tartar powders.

Q. What do you refer to as cream of tartar powders? A. Well, I had in mind the Royal baking powder. That is an expensive powder. I have never been able to buy the Royal baking powder at anything like the price I can buy Calumet or other alum baking powder.

Q. Was there any other consideration than the question of cheapness which induced you to use this Calumet baking powder? A. When I went there and took charge of the hotel as manager they were using this powder and when it was necessary to replenish the stock I spoke to the baker about it—he is the same man who had been there before my time—and asked him if it was satisfactory and he said that it was and that the guests had been kind enough to compliment his bread and of course as it was giving satisfaction I continued to use it ever since.

Q. Did anyone ever tell you when selling you that powder that it contained alum? A. No, I don't think so.

Q. Did you ever tell any of your guests that the bread or cake they were eating was made with a baking powder containing alum? A. No, sir.

Q. Why? A. For the simple reason in the hotel business you would never tell your guests that they were furnished with a steak from the loin of an 800lb steer to-day and a 1,200lb steer tomorrow. I do not go around and state to the guests that we are using Calumet baking powder, or that they are being fed on Armour's Star hams.

Q. You say that the bread, or rather that the cook was complimented by some of the guests on account of the fine bread he had made? A. The baker was, yes, sir.

Q. As far as you know you say that none of your guests have ever been notified that the baking powder you use contains alum? A. No, sir.

Q. Can you give any reason why that was not done? A. Nothing further than I have already stated. Those matters are not discussed with the guests.

Q. You spoke of never having had any complaints on account of the use of Calumet baking powder. Your guests are sick at the hotel at times are they not? A. Yes, sir; you will always find some sickness in that number of people.

Q. What causes the sickness of course you are not informed? A. Well, I would be in this way: That if several of the guests happened to be affected the same way I would naturally inquire as to the cause of their sickness as that would be a matter that would interest me in the conduct of the hotel.

Q. But you can not say that the sickness you have at your hotel does not result from the use of baking powder

containing alum? A. If it was confined to one person probably not. If several persons were ill at the hotel I would be notified and would endeavor to find out the trouble. May I explain that matter?

Q. Yes, any explanation you have to make I am willing to hear. A. It is a well known fact that we are sometimes troubled with poor water in Chicago and if there was anything wrong with a number of the guests at the same time I would be very anxious to find out what the trouble was but if one or two happened to be ill as they sometimes are I would probably not be notified as to the nature of their trouble unless it happened to be a contagious disease, then I would be notified at once.

Q. But you can not say that alum baking powder has never been the cause of a single case of illness at your hotel? A. No, of course a single case might pass unobserved, but if it came from that it is reasonable to suppose that it would affect several people the same way in which case my attention would undoubtedly be called to it.

Q. A disturbance of the digestion or matters of that kind would not be called to your attention would they? A. No; hardly.

Redirect Examination.

By Mr. Seddon:

Q. You say that any illness at the hotel could not amount to much before you would be informed of it? A. No, of course we look after the health of our guests as much as possible.

EDGAR E. SUMNER, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Edgar E. Sumner.

Q. Where do you reside? A. Here in St. Louis.

Q. What is your occupation? A. I am manager of the West End Hotel.

Q. How long have you been in the hotel business? A. About forty years.

Q. How long have you been at the West End Hotel? A. Since 1892.

Q. What kind of a hotel is the West End hotel as regards its patrons, whether they are permanent or transient guests? A. It is a family hotel and nearly all of the guests are permanent. We do some transient business.

Q. What is the size of the hotel? A. We have one hundred and twelve rooms.

Q. How many boarders do you have? A. About 175.

Q. Do you use any baking powder in the preparation of food at that hotel? A. Yes, sir.

Q. How long have you used baking powder in the preparation of food in your hotel? A. I have used it constantly for about thirty years—twenty-eight to thirty years.

Q. What brand of baking powder are you using at the West End hotel at the present time? A. I do not know the name of the brand. It is manufactured by a man by the name of Forbes.

Q. Do you understand it to be an alum baking power? A. Yes, sir.

Q. I will ask you if it is not a fact that it is known as Forbes brand of baking powder? A. It may be. I never noticed the brand particularly. We always call it the Forbes baking powder and I think since you mention it it is called the Forbes brand.

Q. State what complaint, if any, you have heard in your hotel about the use of baking powder in the preparation of food? A. We have never had any complaint whatever.

Q. What satisfaction has it given? A. Perfect satisfaction.

Q. Have you heard any complaints whatever? A. No, sir; none whatever.

Q. Have you ever heard any of the guests complain that their digestion had been injured or impaired by the use of alum baking powder in the preparation of food? A. No, sir.

Q. What has been your experience during all of the

years you have used baking powder? A. It has always given good satisfaction ever since I have been using it.

Q. I mean of course powders said to contain alum? A. Yes, sir; it has been about twenty-five years at least since they first came on the market.

Q. What kind of bread does this baking powder make? A. It makes fine bread.

The Court: Do I understand you to say you have been using the so-called alum baking powders about twenty-five years? A. They came on the market twenty-five or twenty-eight years ago.

Q. Have you had any experience in using the so-called cream of tartar baking powders? A. Yes, sir. I have used both the alum and the cream of tartar powders.

Mr. Seddon: You say it makes fine lightbread? A. Yes, sir.

Q. How is it with reference to its edibility? A. You never could distinguish any difference between food prepared with cream of tartar baking powder and alum baking powder. I have used the Royal and other brands but I never could notice any difference between the food prepared with a good brand of alum powder or a good brand of cream of tartar powder.

The Court: What other places have you kept, besides the West End hotel where you used alum baking powder? A. I kept the Kirby hotel and the Plankington House at Milwaukee, the Kirby house at Menominee, Mich., the Railroad Eating House at Saginaw, Mich., the New Denison of Indianapolis, the Crescent hotel at Eureka Springs and the Lindell hotel here in St. Louis—then the West End.

Cross Examination.

By Mr. Cunningham:

Q. How do you know Mr. Sumner that the baking powder you are using is an alum baking powder? A. Simply because they told me it was.

Q. Who told you it was? A. The manufacturer—the party I buy it from. I suppose he is the manufacturer.

Q. Who is that party? A. A Mr. Forbes.

Q. Where is his place of business? A. It is down on Second or Third street.

Q. Here in St. Louis? A. Yes, sir.

Q. Do you buy the powder from him? A. Yes, sir.

Q. Did he tell you the powder contained alum? A. Yes, sir.

Q. How did he come to tell you that? A. I asked him the question.

Q. Were you looking for a baking powder containing alum? A. I was looking for a good baking powder.

Q. Did you see the package in which it is put up? A. We buy in bulk.

Q. Is there anything on the receptacle in which it comes indicating that it contains alum?

Objected to as incompetent.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the court at the time.

Q. Did you ever state to your guests that you were using a baking powder in the preparation of their food that contains alum? A. No, sir; I did not.

Q. Is there any other reason than the relative cost of the two which induces you to get an alum baking powder in preference to a baking powder that did not contain alum? A. No, the price was the only thing.

Q. If two kinds of baking powder were sold for the same price would you select a baking powder containing alum in preference to a powder that did not contain alum?

Objected to as incompetent for any purpose.

Objection overruled.

Defendant's counsel then and there excepted to the ruling of the court at the time.

A. Well, I don't know that I would make any distinction at all. I consider that one gives as good results as the other.

MRS. J. E. HINES, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Stoner:

Q. State your full name? A. Mrs. J. E. Hines.

Q. Where do you reside? A. Here in St. Louis.

Q. What is your business? A. Keep a boarding house.

Q. A private boarding house? A. Yes, sir.

Q. How long have you been keeping a private boarding house? A. For six years.

Q. How many boarders do you have? A. From sixty to seventy-five.

Q. Are they transient or permanent boarders? A. They are most all permanent boarders. But very few of them are transient.

Q. About what proportion of them would be permanent boarders? A. At least fifty there all the time.

Q. Men, women and children? A. No children.

Q. Do you use alum baking powder in the preparation of the food for your boarders? A. Yes, I suppose I do.

Q. You say you use it? A. Yes, sir.

Q. Did you ever have any complaint from any of your boarders about the use of alum baking powder in the preparation of their food being unhealthy or injurious? A. No, sir; I never heard any complaint like that.

Q. What satisfaction has the alum baking powder given that you have used in the preparation of food? A. It has always given the very best satisfaction.

Q. What injurious effects, if any, have you noticed arising from the use of alum baking powder in the preparation of food? A. I have never noticed any bad effect from it.

Q. State what kind of bread this baking powder makes? A. We do not use it for regular light bread. We use it for warm bread. It makes splendid biscuits.

Q. You say it makes nice biscuits? A. Yes, sir.

Q. And cakes and things of that kind? A. Yes, sir.

Q. How is it with reference to edibility? A. I only know that they eat all I can bake of it.

Q. As the saying is, they go like hot cakes? A. Yes, sir.

Q. What brand of baking powder do you use? A. The Jack Frost brand.

Cross Examination.

By Mr. Cunningham:

Q. Where is your place of business, Mrs. Hines? A.

No. 1717 Chouteau avenue.

Q. Do most of these people board at your place that is do they stay there nearly all the time or do they come and go? A. Well, a good many of them stay there with us in the house and a good many of them room in the neighborhood.

Q. You have some who just take their meals there? A. Yes, sir.

Q. And some who room there? A. Yes, sir.

Q. I understood you to say you do not make what we ordinarily term light bread, such as you use on your table? A. No, we only make the biscuits and warm bread like that for breakfast. We buy the loaves of bread from the baker.

Q. Do you know that the baking powder that you use contains alum? A. I never knew it until lately.

Q. How did you learn it then? A. I was told by the young gentleman who came around and talked to me about this suit.

Q. That was the first that you knew about the baking powder containing alum? A. Yes, sir; I had never thought about it before.

Q. Would you have used it if you had known that it contained alum? A. I don't think that would have made any difference.

Q. You say it would have made no difference to you? A. No, sir.

Q. You say you did not consider the question as to whether the alum in it was injurious or not? A. I did not know there was alum in it until I was told so after this suit was brought.

Q. You do not know whether the alum in it was injurious or not? A. No, sir.

Q. What was your object in buying this particular baking power? A. I bought it because it was much cheaper and had the same effect.

Q. You mean it had the same effect as the other powder in raising bread and biscuit? A. Yes, sir.

Q. You did not have any reference to the question as to whether it might or might not be wholesome? A. No, sir; I didn't think anything about that.

Redirect Examination.

By Mr. Stoner:

Q. I do not know whether I asked you the direct question or not as I will ask it now. Does the baking powder you use give satisfaction? A. Yes, sir; it gives good satisfaction. It makes nice light biscuits and cakes.

MRS. F. M. BALL, a witness of lawful age being produced, sworn and examined on the part of the defendant testified as follows:

Direct Examination.

By Mr. Stoner:

Q. State your full name? A. Mrs. F. M. Ball.

Q. What is your occupation? A. I keep a boarding house.

Q. Where? A. At 2207 Locust street, St. Louis.

Q. How many boarders do you have there? A. Usually about fifteen.

Q. Are they permanent or transient. A They are altogether permanent.

Q. What brand of baking powder do you use? A. The Jack Frost.

Q. State whether or not it contains alum? A. I do not know about that.

Q. Have you ever heard any complaint from your boarders as to whether or not their digestion has been impaired from using food prepared with that baking powder? A. No, sir; I never heard any complaint of that kind.

Q. What satisfaction does that powder give? A. It gives good satisfaction.

Mr. Cunningham: I object to his leading the witness.

The Court: She may state what her experience has been in the use of that powder.

Q. What has been your experience in the use of this powder, Mrs. Ball? A. I always get good results from the use of that baking powder.

(Cross-examination declined).

MRS. J. G. MEIGS, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Stoner:

Q. State your full name? A. Mrs. J. G. Meigs.

Q. What is your usiness? A. I run the Lucas Place Boarding House at 1804 Locust street.

Q. How many boarders do have you there? A. It will vary from twenty-five to thirty-five and sometimes forty.

Q. What kind of baking powder do you use in the preparation of food at your establishment? A. We use Grant's.

Q. How long have you been keeping a boarding house there? A. About seven years.

Q. Do you know whether or not that baking powder contains alum? A. I have been told that it does.

Q. What results do you get from its use? A. It makes light wholesome bread and cakes.

Q. Have you ever had any complaint from your boarders that their health has been injured? A. You mean by the use of baking powder in the preparing of the food.

Q. Yes? A. No, sir; I have never had any complaint of that kind.

Q. What satisfaction does it give? A. It gives good satisfaction.

Q. You stated that it makes light wholesome bread and cakes? A. Yes, sir.

Q. And you have never heard any complaints from its use? A. No, sir.

Cross Examination.

By Mr. Cunningham:

Q. Do you know of your own knowledge that this baking powder contains alum? A. Why, I suppose it does.

Q. Why do you suppose so? A. Well, I have been told so.

Q. By whom? A. Well, I have been told so by different parties. I do not remember the names now.

Q. Do you remember the name of anyone who told you that? A. Not in particular.

Q. You don't remember who told you? A. No, sir. I have heard that it did.

Q. Isn't it true that so far as your knowledge goes you never heard that it contained alum until you were requested to testify in this case and then you learned it for the first time? A. Oh, I knew it before that.

Q. How long since did you first learn it? A. I have known that fact seven or eight years.

Q. You knew as much as seven or eight years ago that that baking powder contained alum? A. I don't know about that particular brand but I have known for seven or eight years that alum was used in making baking powder.

Q. What other brands have you used that contain alum? A. I have used that one brand most all the time.

Q. Why have you used a baking powder containing alum all these years? A. Well, whether it had alum in it or not I never thought made any difference. The reason I have used that baking powder all this time is because it gives good satisfaction and makes nice biscuit and corn bread.

Q. Does it give better satisfaction than baking powder that does not contain alum? A. I can not say.

Q. Was there any question of cheapness that induced you to select that brand of baking powder? A. Well after I used it I found that it gave such good satisfaction I never wanted to change.

Q. If baking powder containing cream of tartar was offered you at the same price would you still prefer the powder containing alum? A. I don't know that I would. I would see no reason for not liking this powder. It has always given good satisfaction.

ELLA A. DONALDSON, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Stoner:

Q. State your full name? A. Ella A. Donaldson.

Q. You keep a private boarding house here in the city, do you not? A. Yes, sir.

Q. How long have you been keeping that boarding house? A. About seventeen months.

Q. What kind of baking powder do you use? A. I use the Jack Frost brand.

Q. State whether or not that brand of baking powder contains alum? A. Yes, sir; it does.

Q. Are your boarders permanent or transient boarders? A. They are all permanent boarders.

Q. Have you ever heard any complaints from them on account of having used a baking powder containing alum in the preparation of their food? A. No, sir.

Q. What is the appearance of the bread and biscuit that you make from that baking powder? A. Why the bread and biscuit are perfectly delicious.

Q. Have your boarders complained that they suffer from indigestion on account of using bread and other articles of food prepared with baking powder containing alum? A. No, sir; I have never had any complaint of that kind.

The Court: How long have you lived in that place? A. seventeen months.

Cross Examination.

By Mr. Cunningham:

Q. You say you are using the Jack Frost brand of baking powder? A. Yes, sir.

Q. What brand of baking powder did you use before that? A. I used Dr. Price's.

Q. How did you come to make the change? A. My grocer suggested that I had better try the Jack Frost baking powder. He recommended it as being cheaper and just as good as the other. I tried it and it confirmed what he said.

Q. Do you know of your own knowledge that Jack Frost baking powder contains alum? A. Why, I always supposed it did.

Q. Why do you state that? A. I always supposed that from the price.

Q. The price lead you to believe that it was an alum baking powder? A. Yes, sir.

Q. What was there about the price that led you to

believe that? A. Because it was much cheaper than the others.

Q. How much did you pay for it? A. Twenty-five cents a pound.

Q. What were you paying for the other? A. About fifty cents a pound.

Q. Do you know how the other brands range in price? A. Some as low as ten cents.

Q. Why didn't you invest in a ten cent brand then instead of in a twenty-five cent brand? A. I thought a ten cent brand was a little too cheap to give good satisfaction.

Q. You would prefer a cheaper brand if it was just as good? A. Yes, sir.

Q. Do you consider the Jack Frost powder better than those you get for ten cents a pound? A. I never used any of those cheap brands.

The Court: What has been your experience with the Jack Frost brand as compared with Doctor Price's? A. I had used Dr. Price's for a long time and liked it very well but after I began using Jack Frost I found it gave just as good satisfaction as Price's.

Q. Are you able to detect any difference between the food prepared with the Jack Frost baking powder and the food prepared with Dr. Price's baking powder? A. No, sir.

Q. How is that? A. The bread is just as good as that I made with Doctor Price's baking powder.

Q. And you prefer the Jack Frost because it is cheaper and gives as good satisfaction? A. Yes, sir.

Q. And that is the reason you changed from one to the other? A. Yes, sir.

MRS. ELSIE BRYSON, a witness of lawful age being calle and sworn, testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Mrs. Elsie Bryson.

Q. Where do you live? A. At 1714 Locust street.

Q. What is your business? A. I keep a private boarding house there.

Q. How long have you kept a boarding house there? A. For about two years.

Q. What number of boarders do you have there? A. From twenty-five to thirty.

Q. Are they permanent or transient boarders? A. They are nearly all permanent. Very few what you would call transient.

Q. Men, women and children? A. No children.

Q. Have you ever used any baking powder containing alum in the preparation of food in your establishment? A. Yes, sir; we use Grant's Bon Bon.

Q. What complaints, if any, have you had from your boarders about injurious effects arising from the use of that baking powder? A. No, sir; I have never had any complaints at all.

Q. What kind of bread does it make? A. It makes light wholesome biscuit and lovely muffins which we have for breakfast.

Q. How about the taste of the bread? A. It tastes very nice.

Q. What satisfaction has this baking powder given in the preparation of food? A. It gives the very best satisfaction.

Q. And you say it makes light wholesome bread and cakes? A. Yes, sir; I have frequently been complimented on my bread and cakes.

Q. And you have found it a very satisfactory baking powder? A. Yes, sir.

Cross Examination.

By Mr. Cunningham.

Do you know of your own knowledge whether or not the Bon Bon baking powder contains alum? A. I have heard that it does.

Q. Do you know that of your own knowledge? A. I suppose it does.

Q. Who told you so? A. Well it is cheaper than the other, that is one reason that led me to believe that it contained alum.

Q. Do you understand that all the cheaper baking powders contain alum? A. Yes, sir.

Q. Then you infer from the price that this baking powder contains alum? A. I have been told so.

Q. Who told you? A. I do not remember now who did.

Q. Did you ever discuss with your boarders the fact that the baking powder you use contains alum? A. No, sir; I did not.

Q. You never said anything to them about that fact? A. No, sir.

Q. As far as you know they were not aware of the fact that you were using a baking powder that contains alum, in the preparation of their food? A. No, sir.

JACOB FURTH, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Jacob Furth.

Q. You reside here in St. Louis, do you not? A. Yes, sir.

Q. You are a wholesale grocer I believe? A. Yes, sir.

Q. How long have you been in that business? A. About thirty years.

Q. From your experience in the wholesale grocery business have you learned anything about the baking powder business, its history and its present status? A. Yes, sir.

Q. Are you a large dealer in baking power? A. Yes, sir; we sell large quantities of baking powder.

Q. What are the principal brands that you sell? A. Well we sell Royal as a cream of tartar baking powder and then we sell all the various well known brands of alum baking powder on the market.

Q. Are you acquainted with the principal brands of the so-called cream of tartar baking powder? A. Yes, sir.

Q. Can you name them? A. The three principal brands are the Royal, Cleveland and Dr. Price's.

Q. Are those brands manufactured and sold by several

corporations or by one corporation? A. Up to a short time ago each brand was sold by an independent corporation. Since then there has been a corporation formed known as the Royal Baking Powder Company, which now controls all three brands.

Q. Do you sell large quantities of baking powder, do you? A. Yes, sir.

Q. Wherever your trade extends? A. Yes, sir; Illinois, Missouri, Arkansas and Louisiana.

Q. Is the baking powder business a large business? A. Yes, sir; I do not think there is a grocer in the country who does not keep baking powder in stock.

Q. Then would you say it is a large or small business? A. It is a very large business.

Q. Could you state in dollars and cents the annual volume of trade? A. No; I could not answer that question intelligently.

Q. How universally is baking powder used? A. I stated a moment ago that I did not think there was a retail grocer in the country who does not keep it.

Q. Is it an article of large consumption? A. Yes, sir.

Q. What have you to say as to the use to which it is put in the preparation of bread, cakes, biscuit, etc.? A. Well it is largely used to take the place of yeast and it produces the same result. Not exactly on the same principle but the result is the same.

Q. I understood you to say that you are a wholesale dealer and sell to the retail trade? A. Yes, sir.

Q. What complaints, if any, have you had from any of your retail customers as to any injurious effects that followed the use of the so-called alum baking powder in the preparation of food? A. We have never had any complaints of that kind.

Q. What satisfaction does it give to the trade? A. We presume that it gives perfect satisfaction as we hear nothing to the contrary. If an article like that does not give satisfaction we hear from it very frequently. If it does give satisfaction we rarely hear directly on that point. We naturally conclude if an article has a large sale and no complaints come in that it is giving satisfaction.

Q. Have you ever heard any complaints that the alum

baking powders you were selling impaired the digestion of the persons who used the food prepared with it? A. No; we never had any complaint of that kind.

Q. You say you do a large baking powder business? A. Yes, sir.

Q. Throughout the various sections of the country? A. Yes, sir; wherever our trade extends.

Q. Is the business increasing? A. Yes, sir.

The Court: How long have you been handling the alum baking powder? A. My attention was first called to alum baking powder twenty years or more ago. The first I ever heard of was put up by a man by the name of Clogworthy at Baltimore.

Q. About what is the relative proportion between your sales of the alum baking powder and the cream of tartar baking powder? A. We sell ten times as many pounds of alum powder as we do of the cream of tartar powder, but the cream of tartar powder being so much higher in price the difference in dollars and cents would not be so great.

Mr. Seddon: You are president of the Wholesale Grocer Association, are you not?

A. No, sir; not now, I was at one time.

Q. What kind of baking powder do you use in your family? A. We have been using the cream of tartar baking powder. I think in my family like in a great many others it is simply a matter of prejudice on account of the large advertising which the cream of tartar people do setting forth the fact that the alum baking powders are injurious and I suppose like most people, wishing to take no risk, they get the cream of tartar powder. I think it is largely a matter of prejudice though.

Cross Examination.

By Mr. Cunningham:

Q. You speak of the prejudice that exists. Is that prejudice widespread in general? A. I think that prejudice comes from being misled by the advertisements that appear in favor of the cream of tartar powder.

Q. Is that prejudice general? A. Yes; I must say that it is.

Q. You say there is a general prejudice against the use of baking powder that contains alum? A. Yes, sir.

E. H. KEISER, a witness of lawful age being produced sworn and examined testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Edward H. Keiser.

Q. You are one of the professors in the Washington university, are you not? A. Yes, sir.

Q. In what department? A. I am professor of chemistry.

Q. Will you please state for the information of the Court what time you have devoted to matters of chemistry? A. In 1880 I took my degree of bachelor of science at Swarthmore college, Swarthmore, Pa., and in 1881 the degree of master of science in the same institution. In 1884 I took the degree of doctor of philosophy in the John Hopkins university at Baltimore, Md., after which I studied in Germany, part of the time at Heidelberg and afterwards at Freiberg, Saxony. Also in Goettengen in Germany.

Q. Have you devoted your whole time to matters of chemistry during all the years since that time? A. Yes.

Q. Are you at present occupying the position of Professor of Chemistry in the Washington university of St. Louis and are you the head of that department? A. Yes, sir.

Q. Have you made analyses of what are commonly called alum baking powders? A. I have.

Q. When did you make the analyses you refer to? A. I began about the middle of October last, October, 1899.

Q. What brands of baking powder did you analyse? A. I will have to refer to my notes on that (witness here consults memorandum), I have here a record of the analyses I made of different brands of baking powder.

Q. Refresh your recollection from your list and give us the names of the different brands analyzed by you? A. I analyzed Layton's Quick Health Food baking powder. Do you want me to give the percentages as I go along?

Q. No, we will get the list you analyzed first and I will call for the percentages later on? A. Then continuing my answer, I will say that I also analyzed a brand known

as Grant's Improved (No. 1). (3) Blossom. (4) Bon Bon. (5) Grant's Improved (No. 2). (6) One Spoon. (7) Jack Frost. (8) H. & K. Yeast Powder. (9) Sheppard's (10) Forbes Baking Powder. (11) Jack Frost No. 2.

Mr. Cunningham: You speak of Jack Frost and Jack Frost No. 2. Are those different brands or different samples? A. Those are merely different samples.

Q. Does the same answer apply to Grant's Improved and Grant's Improved No. 2? A. Yes, sir.

Mr. Seddon: Where did you get the samples of baking powder you analyzed? A. The samples were brought to me by Mr. Stoner and Mr. Bain.

Q. At whose request did you analyze the different samples of baking powder submitted to you? A. At the request of the gentlemen named.

Q. Now before going into the question of percentages I will ask you the general question, did all of the samples which you analyzed contain alum? A. Yes, sir; they all contained alum.

Q. Now will you please give us the results you obtained from your analyses, beginning with the Layton brand?

Mr. Cunningham: Of course the Court understands that we are objecting to this testimony on the ground already stated heretofore and for that reason I have not interposed objections as the questions were put, but I want now to interpose a further objection to any testimony from this witness concerning any other brand of baking powder than what is known as the Layton powder, being the powder which this defendant is charged with making, for the reason that his analyses of any other powder, if developed in his examination, could not have the slightest bearing on this case. I make this further objection now as I take it that counsel for defendant intends to go into the whole list read by the witness.

Mr. Seddon: That is our intention.

The Court: It has been stated here that the powder manufactured by the defendant Layton represents a type of the so-called alum baking powders. In conducting this examination I shall expect you to confine yourself to testimony concerning the analysis of that class of powders. I will make that ruling now in order that you may both understand clearly how far the Court will permit you to go.

To which ruling of the Court counsel for the State then and there excepted at the time.

Mr. Seddon: I asked you to state the results of your analysis of the Layton Quick Food Baking Powder? A. Yes, sir; I found in that case the total amount of carbon dioxide was 10.4 per cent.

Q. What do you mean by the term carbon dioxide? A. I mean the total amount of carbonic acid gas was 10.4 per cent.

Q. Well go on and state the other ingredients? A. I found sodium bi-carbonate, 20 and 2-100 per cent. Sodium alum 20 and 4-100 per cent, starch and insoluble matter 59 and 58-100 per cent, making the total 100 per cent.

Q. Dr. what is alum? A. I suppose you refer to sodium alum such as I found present in this powder. Sodium alum is a combination of a sodium sulphate with an aluminum sulphate with water of crystalization.

Q. And as I understand it, is it a double sulphate of sodium and aluminum? A. Yes, sir.

Q. Is that the form of alum you found in the Layton powder you analyzed? A. It is generally termed sodium alum, but in this case, of course, it was free from the water of crystalization.

Q. What is the chemical symbol? A. The symbol is Na-2, So-4, Al-2, (So-4) 3.

Q. Now did you analyze what is known as the Forbes baking powder?

Same objection.

Objection overruled.

Counsel for the State then and there excepted to the ruling of the Court at the time.

The Court: Understand that you are to confine your examination to the class of so-called alum baking powder.

Mr. Seddon: It will develop that this powder comes within that class.

The Court: Proceed then.

Mr. Seddon: You did make an alaysis of the Forbes baking powder? A. Yes, sir.

Q. Then go on and state the result? A. I found

Sodium bi-carbonate.....22.28 per cent
Total carbon dioxide.....11.67 per cent
Sodium alum .....16.83 per cent

Acid calcium phosphate.....11.60 per cent
Starch and insoluble matter.....49.24 per cent

Q. Did you analyze the Jack Frost Baking Powder?

Mr. Cunningham: It is understood that we are objecting to this line of testimony. I do not want to be continually interrupting with my objections.

The Court: I so understand it.

A. Yes, sir; I analyzed the Jack Frost brand and found it contained:

Carbon dioxide ....11.70 per cent
Sodium bi-carbonate ....22.34 per cent
Sodium alum ....19.90 per cent
Acid calcium phosphate.....9.92 per cent
Starch and insoluble matter.....47.84 per cent

Q. Now take the "Bon Bon" brand? A. In the Bon Bon brand I found:

Total carbon dioxide.....11.84 per cent

Q. Before going further let me ask you about the carbon dioxide. Was that the total amount given off? A. Yes, sir. That is the carbonic acid gas which in these cases is the leavening gas.

Q. Proceed? A. I found:

Carbon dioxide ....11.84 per cent
Sodium bi-carbonate..... .....22.60 per cent
Sodium alum.... .... 23.00 per cent
Starch and insoluble matter.....54.40 per cent

Q. Now Doctor, when this alum baking powder is mixed with the flour and water to make the dough from which the bread is baked does any chemical action take place and if so what? A. Yes, sir; a chemical reaction starts at once—as soon as the water is added. It would not, of course, start when mixed with the dry flour alone. Water must be added.

Q. What is the result of the chemical reaction? A. The carbon dioxide is driven off and passing upward through the dough makes it puff up or as the housekeeper terms it "raises" the bread. This is what gives the bread the light appearance as compared with the heavy solid character of the dough when first mixed.

Q. Now was anything left after the carbon dioxide was driven off? A. Yes, sir; taking the Layton powder which I was considering I found there was left a sodium sulphate and an aluminum hydrate.

Q. What is aluminum or aluminium, are they different? A. No, it is merely a difference in pronunciation.

Q. What is aluminum? A. It is a metal that is contained in the clay of the earth.

Q. What is alumina? A. It is an oxide of that metal which is also contained in the clay.

Q. Is it an ingredient of the clay? A. Yes, sir; a basic constituent.

Q. Now what is aluminum hydrate—is it alum or not? A. No, sir; it is not alum.

Q. What is the difference between it and alum? A. That is a hard question to answer. It is a different substance entirely. That is the best answer I can give.

Q. Is it an entirely different substance? A. Yes, sir; entirely different.

Q. Now while it has been in part derived from the alum I will ask you if it has any relation whatever to the alum? A. No, sir; it is an entirely different substance.

Q. How is the alum made? A. Do you want to know the process of its manufacture. I do not know that I can answer that. I can tell you what elements will make it. I know nothing about the process usually employed in its production as an article of commerce.

Q. If you wanted to produce it what elements would you use? A. Aluminium, sulphur and oxygen are combined to make an aluminum sulphate; sodium, oxygen and sulphur make a sodium sulphate. These two sulphates combine to make the alum.

Q. Is the chemical combination entirely different from the constituent elements? A. Yes, sir; the elements are entirely separate and distinct. They have no relation so to speak to the compound.

Q. Doctor right here I will ask you to explain to the Court the difference between a mechanical combination and a chemical combination? A. A familiar example of a mechanical combination is the mixing of flowers of sulphur with iron filings. It is simply mechanically grinding together the two substances and the result is a mixture with properties intermediate between the two. No change takes place in the nature of the substances themselves. Whereas in a chemical combination there is a complete change of the nature of the original elements. The identity of the original substances is

lost and new substances entirely are formed which have no relation whatever to the original substances. Their properties are entirely different.

Q. Now will you please give us the exact proportions of the different ingredients used in making the alum baking powder? A. In order to bring about a complete chemical reaction and have none of the original elements left, in making alum baking powder it is necessary to use 504 parts of pure bi-carbonate of soda which will react exactly with 484 parts of sodium alum. Those are the exact proportions. The proportion is 504 bi-carbonate of soda to 484 sodium alum. In smaller numbers, about 50 to 48.

Q. About fifty parts bi-carbonate of soda to 48 of sodium alum? A. Yes, sir.

Q. Now what is the result of the chemical reaction? A. They neutralize each other.

Q. Now you have mentioned the fact that in analyzing some of the samples of baking powder submitted to you, you found that some contained acid phosphate of calcium as one of the ingredients. Now I will ask you if you analyzed a loaf of bread baked with powder of that kind and if so what was the result? A. I take an ordinary loaf of bread to weigh 14 ounces. I prepared the loaf according to the directions on the can which were to use two teaspoonfuls of the powder to a quart of flour. I estimated it to be 2 per cent. In fact I weighed it and ascertained that it was 2 per cent. The flour was made into a dough and the bread was baked to a brown crust on top. I afterwards analyzed the loaf and obtained the following results:

Sodium sulphate.....46-100 of one per cent
Aluminum phosphate.....13-100 of one per cent
Calcium phosphate.....8-100 of one per cent

Q. Of what? A. Of the total weight of the loaf of bread.

Q. That was the amount of matter you found? A. Yes, sir.

Q. How many grains would it be in a 14 ounce loaf if you made the calculation in grains? A. I figured out the total number of grains in the whole loaf to be 6,125. Now 2 per cent of that was baking powder which gives 122 and 1-2 grains. Now the products obtained from that were 5 and 36-100 grains of calcium phosphate, 8 and 44-100 grains of

aluminium phosphate and 28 and 6-10 grains of sodium sulphate.

Q. In a fourteen ounce loaf of bread baked with that powder? A. Yes, sir.

The Court: The last products you spoke of are the products in the loaf of bread, from the baking powder, after the bread is baked? A. Yes, sir.

Q. What per cent did you say they form of the whole loaf? A. Taking the whole loaf as fourteen ounces the percentage of sodium sulphate is forty-six one-hundredths of one per cent. The alumina phosphate is thirteen one-hundredths of one per cent. The calcium phosphate is eight one-hundredths of one per cent.

Q. Of the weight of the loaf? A. Yes, sir.

Mr. Seddon: Now Doctor, sodium sulphate is commonly known as what? A. As glauber's salts.

Q. Now you spoke of phosphate of aluminum, state whether or not it has any of the properties or qualities of alum? A. No, sir; it is a substance entirely separate and distinct from alum.

Q. As different as silver and gold? A. As different as sugar and salt. It is an entirely different substance.

Q. It is chemically speaking a different substance?

Objected to as leading.

Mr. Cunningham: I have not protested heretofore on this point of leading questions but I certainly do not feel that it is right for counsel to be putting words in the mouth of the witness.

Mr. Seddon: I do not think there is any danger of my misleading an intelligent witness of this kind and I thought best to direct his attention to the point on which I desire his testimony.

The Court: A reasonable amount of leading is permissible to direct the attention of the witness to a particular matter but I wish you would avoid that form of question as much as possible.

A. They are chemically different substances.

Q. Now in what form does the calcium appear there? A. As a calcium phosphate.

Q. Is that in the same form as which it appears in the original baking powder? A. No, sir; it is an entirely different form. In the powder it is simply a hydrate calcium

phosphate and it afterwards appears as a dry calcium phosphate.

Q. Now going back to the Layton powder you analyzed, I will ask you to state what is the result of the reaction when the powder is mixed with the flour and made up into dough, as is the case when bread is made?. A. When the powder is mixed with the dry flour, and afterwards water is added, a chemical reaction commences at once. Carbon dioxide is formed and in the process of baking this is driven off, passing up through the mass of dough, which lightens or leavens the whole mass, that being the object of using the baking powder.

Q. Now what did you find was left in the bread as the residue from the baking powder? A. I found there was a sodium sulphate and an aluminum hydrate.

Q. Sodium sulphate is glauber's salts? A. Yes, sir.

Q. Now in the powders where you use, or rather where was used a calcium phosphate, what did you find? A. I found an aluminum phosphate in addition to the others.

Q. Those elements remained behind? A. Yes, sir.

Q. Now in the case where the baking powder was composed of bi-carbonate of soda and sodium alum you found the residue to be sodium sulphate and an aluminum hydrate? A, Yes, sir.

Q. Then I will put this question: What has become of the alum and the bicarbonate of soda originally used in the powder? A. Those substances have entirely disappeared. The bicarbonate of soda is an alkali and the sodium alum is the acid, and when combined, the alkali and the neutralizes the acid and carbon dioxide is formed which is driven off.

Q. Leaving sodium sulphate or glauber's salts? A. Yes, sir.

Q. And aluminum hydrate? A. Yes, sir.

Q. Now in the fourteen ounce loaf, baked with the Layton powder, as you have described it and which you have already analyzed, will you please state the number of grains of aluminum hydrate contained in it, and also the number of grains of sodium sulphate? A. The exact figures are as follows: The loaf of bread weighed fourteen ounces, that is the bread baked with Layton's Quick Health Food baking powder. It gave as the result of my analysis, in grains, 10.17 grains of aluminum hydrate and 9.9 grains of sodium

sulphate or in per cent it would give 16-100 of one per cent of aluminum hydrate and 166-1000 of one per cent of sodium sulphate.

Q. Now, professor, did you make any bread with this Layton's Health Food powder and if so state what the experiment was that you made with reference to the bread, what took place and what was the result? A. I baked a loaf of bread as follows: I first mixed with dry flour two per cent of Layton's baking powder. Those were the directions given on the box or rather it said two teaspoonfuls to a quart of flour, which I ascertained to be two per cent. Taking then two per cent of Layton's baking powder I mixed it thoroughly with the dry flour and afterwards added a sufficient quantity of water to make a dough of the proper consistency.

Q. Before going further I will ask you if this Layton's baking powder was the same that you got from Mr. Stoner and Mr. Bain? A. Yes, sir. It is the same brand that I got from those gentlemen and it is the same that I have seen here in Court.

Q. Well go on and describe the operation of baking the bread? A. After the bread had been brought, or rather the dough had been brought to a proper consistency I baked it in an oven to a brown crust on the outside.

Q. Did you use any ingredients other than those you have already mentioned? A. No, sir.

Q. Then go on and state what was done? A. After the bread was baked I then proceeded to analyze the loaf by chopping it up very fine, putting in a sufficient quantity of distilled water and allowing it to stand forty-eight hours. I should state here that the water was cold. I then filtered off the aqueous extract and tested it for free alum, or for any soluble aluminum compound. In the reaction, the aqueous extract showed no soluble aluminum compound and therefore I concluded that there was no free alum in the loaf of bread. If there was any at all it was certainly in such a small quantity that it could not be detected. I then took the same loaf of bread which was chopped fine and after allowing it to stand in cold water tested the extract, or rather before testing the extract I added hydrochloric acid and then filtered the acid extract two or three times to make sure that there was no organic matter contained in the extract. This acid solution was then tested for sulphate of aluminum compound and I

found there was present an aluminum hydrate and on calculating the percentage I found it to be 16-100 of one per cent present in the loaf. Then the sodium sulphate was determined by chopping the loaf fine, dissolving it in water and allowing it to stand for forty-eight hours and after the water, or rather the aqueous extract was filtered off I added barium chloride which would precipitate the sulphate of sodium, if any was present. After the sulphate of barium was precipitated it was filtered and washed and dried and then I calculated the amount in percentage of the sodium sulphate present.

Q. That is the method of analysis you used? A. Yes, sir.

Q. And you made your calculations and arrived at your percentages? A. Yes, sir.

Q. And the percentage of aluminum hydrate given by you is a maximum? A. Yes, sir; that is the maximum that could have come from the alum in that baking powder after baking that loaf of bread.

Q. I will ask you whether part of that hydrate of aluminum might not have existed in the other constituent elements of the bread? A. It could have come partly from the flour. A small quantity could have come from the flour.

Q. Does flour itself contain any aluminum? A. I have made no analysis of flour for that purpose but I find in our books records of analysis of flour in which aluminum has been found.

Q. Can you state, professor, in what form that aluminum hydrate, which was in the bread, took while it was in the bread? A. I do not quite understand your question.

Q. I perhaps used the word aluminum hydrate. I should have said aluminum. Can you state what form the aluminum took, while it was in the bread, as you found it? A. It was there in the form of an aluminum hydrate. I got it that way.

Q. Are there any constituent elements in the bread that would tend to form insoluble compounds with aluminum? A. It is probable. Aluminum has the power to combine with organic substances.

Q. Now, Professor, when you prepared what you termed the proper formula for baking powder, that you gave us a while ago, you used pure alum did you not? A. Yes, sir.

Q. Now, as a matter of fact, commercial alum is not as pure as that you used, is it? A. Not quite so pure and, therefore, it might require a little more than the formula I gave.

Q. State whether or not in that formula you allowed for impurities in commercial alum? A. No; the formula I gave was for pure alum, commercial alum I understand contains some impurities and therefore slightly more of the alum would have to be used to allow for the difference, otherwise there would be no material difference between the formula I gave and the formula if you use commercial alum. It is the aluminum sulphate that does the work in this case—that is—furnishes the acid which produces the reaction resulting in the formation of carbon dioxide and therefore there would be but very little difference. In some commercial alum there is less sodium sulphate but that would cut no figure. It has no action on the carbon dioxide.

Q. What is the sodium sulphate as it exists in the commercial alum? A. Simply a component part of the alum, that is the best answer I can give you.

Q. The aluminum sulphate combined with the bicarbonate of soda liberates the carbon dioxide? A. Yes, sir.

Q. Leaving as a residue the substances you have already mentioned? A. Yes, sir.

Q. Then as I understand it commercial alum would have more sodium sulphate than the pure alum? A. There is a slight excess of sodium sulphate in the commercial article.

Q. Does that vary? A. It may vary in different cases, but slightly.

Q. Now, Professor, what effect has the reaction you have described, that takes place between these materials, when the baking powder is mixed with the flour in making dough, upon the nature of the alum used in the baking powder? A. How do you mean upon the nature of the alum?

Q. I mean with reference to what becomes of the alum. Is it destroyed? A. Yes, sir. It is destroyed entirely and new compounds of a different nature are formed.

Q. The alum no longer exists? A. No, sir; the alum is destroyed entirely and the chemical reaction produces carbon dioxide, which is driven off, and is the leavening agent, and there is left sodium sulphate and aluminum hydrate.

The Court: Does this substance have any effect on the digestion, such as alum would have? A. I never investigated that, but I should say not as it is an entirely different substance.

Mr. Seddon: What would be about the size or bulk of the hydrate of aluminum that you would get from a loaf of bread containing or weighing fourteen ounces? A. You mean the bulk? I have given the weight as 16-100 of one per cent. It is a very small quantity. It is difficult to describe the bulk if that is what you want.

Q. What would be the bulk of the hydrate of aluminum left in a fourteen ounce loaf of bread with reference to the size of an ordinary pin head? A. Well a pin head is an uncertain quantity as they might be large or small.

Q. Well take the small ordinary pin in common use? A. Perhaps I can illustrate it a little better by saying that the amount of aluminum hydrate present in a loaf weighing fourteen ounces could be held on the blade of an ordinary pocket knife. The point of the blade.

At this stage of the examination the further hearing of the case was adjourned until 2 p. m., to-morrow.

St. Louis, January 12, 1900.

The further hearing of this case was called at 2 p. m., this twelfth day of January, 1900, when the following proceedings were had:

PRESENT:

Mr. Cunningham for plaintiff.
Mr. Seddon and Mr. Stoner for defendant.

E. H. KEISER, being still on the witness stand was further examined as follows:

Direct Examination (continued).

Mr. Seddon: We have the typewritten transcript of part of your testimony and Major Cunningham has kindly

called my attention to a probable error of the stenographer in writing up the transcript. He has the chemical symbol here Na2, So4 and Na2, So4 taken three times. Is that correct? A. No; the symbol should be Na2, So4 and Al 2 3 (So4).

A. I will ask you if there is anything further you desire to state in regard to the amount of the product that was left in a fourteen ounce loaf, after the chemical reaction took place? A. I was called upon to state how much of the product was left, of the baking powder, in a loaf of bread. I did not go into a detailed explanation as I might have done but I wish to say now that the average loaf bread, take the average baker's loaf, weighs fourteen ounces and in the loaf I made which weighed fourteen ounces I estimated, in fact I weighed the amount of baking powder, which was two per cent of the weight of the loaf of bread. Now then I have already stated that in round numbers twenty per cent of the baking powder was alum which would be one fifth of the baking powder. Now it is a matter of mathematical calculation that if two per cent is baking powder and one-fifth of that is alum the total amount of alum would be one-fifth of two per cent which is two-fifths of one per cent, or expressing it in a decimal .4, of one per cent, of the loaf of bread went in as alum. Now then it also developed during the course of my explanation that when the chemical reaction takes place and the carbon dioxide is driven off, the residue is sodium sulphate (glauber's salts) and aluminum hydrate. Now one-third of the weight of the alum goes into the aluminum hydrate so that the amount of aluminum hydrate present in the bread, as the result of using the baking powder or, I will say present in a fourteen ounce loaf, that would be better, is one-third of four-tenths of one per cent which is thirteen one-dundredths of one per cent. Now the question was asked me as to what bulk this would represent and I was at a loss at the time to think of some familiar object with which to compare it. A pin head was suggested but as pins vary so much in size such a calculation might be misleading and I will say now that the bulk would be somewhere in size between the head of an ordinary pin and a grain of wheat.

Q. The amount of aluminum hydrate left in the loaf of bread would be somewhere in size between the head of a pin and a grain of wheat? A. Yes, sir.

Q. Now Doctor, I will ask you if you can state about what amount of bread the average person would consume in a meal? A. That would vary greatly with different persons but I should say that a quarter of a loaf at a meal would be a big average for a healthy man with a good appetite.

Q. Now, you have already stated that there are 13-100 of one per cent of aluminum hydrate in the bread, so that if a man consumed one-fourth of a loaf at a meal he would be getting one-fourth of 13-100 of one per cent which would be 13-400 of one per cent of aluminum hydrate, or, as you expressed it, one-fourth of the bulk of a grain of wheat? A. Yes, sir.

Q. You have stated that there was a certain amount of aluminum hydrate in a loaf of bread and during the course of your examination I think you also stated that the amount of alum in the baking powder would only account for about eight grains of aluminum hydrate whereas, as a matter of fact you had something like ten grains. I don't remember the exact figures but the difference is about that much. I think you stated at the time that the excess must come from some oher source. Will you please tell us from what source? A. I think I stated that it probably existed in the bread in that form independent of the baking powder used.

Q. How could it get in then if not produced there by the baking powder? A. The only way would be through the flour.

Q. Does it ever exist in the flour? A. Yes, sir.

Q. Could it exist in the form of a phosphate of aluminum? A. Yes, sir.

Q. You think it is possible to exist there in that form originating from the composition of the flour itself? A. Yes, sir; it could only come from that source, there being no other sources except the baking powder and flour, and as there was an excess of what could be accounted for by the presence of the alum in the baking powder that excess must come from the only other source, the flour.

Mr. Cunningham: I don't want to interrupt this examination, if the Court please, but it seems to me that this matter was all gone into yesterday. If he wants to correct any statements made by the Doctor yesterday well and good but it seems to me this is going right over the same ground

and certainly his questions are objectionable as leading and it seems to me that counsel is stating his opinion to the witness and then asking him whether or not it is true.

Mr. Seddon: I merely wanted to get this matter fixed as to the amount of the aluminum hydrate present in the bread and for that reason I was merely continuing along the line we were on when the Court adjourned last night. He said that there was a certain amount of aluminum hydrate present in the bread and just at the close of the examination we were trying to fix the bulk by some familiar example.

The Court: You may proceed with the testimony but I trust you will avoid leading the witness as much as possible.

Q. When you spoke about two per cent being baking powder, you meant two per cent of the weight of the loaf was represented by baking powder? A. Yes, sir.

Q. You said something last night about some of these cans of baking powder. Is there any statement you wish to make in regard to them? A. Yes; in speaking of analyzing the contents of some of those cans I stated that I made an analysis from samples submitted to me by Mr. Stoner and Mr. Bain. I wish to state now that in addition to the analysis of those cans I made an analysis of another can of Layton's Quick Health Food baking powder that came to me from New York. That can is here in the room. It is in my satchel and if you will bring the satchel here I will get it. (A satchel is here produced from which the witness takes a tin can covered with a white label and then continues.) This can I received on January 4th by registered mail, from New York. It was sent to me by Dr. Ernest E. Smith of New York and I was requested to make an analysis of it. I made an analysis and I found it to be the same as all the other samples of Layton's Quick Health Food, that I examined. There will always be a slight variation in analysis of this kind but those variations are in the hundredths and are to be expected.

Mr. Seddon: I will offer in evidence the can produced here by the witness and ask that it be marked by the stenographer defendant's exhibit E, January 12, 1900.

The can identified by the witness was accordingly marked "Defendant's Exhibit E, January 12, 1900."

Mr. Seddon: I will make a formal offer of that can

now for fear I may forget it. I will state now that I am through with the direct examination of this witness.

Mr. Cunningham: It may be a little out of the order of our regular procedure but I would ask the Court that Dr. Keiser be withdrawn because we have here as a witness for the State in rebuttal, Prof. Mallet, of the University of Virginia, who has been here in attendance two days but who is called home to-night in order that he may attend as a witness before an investigating committee of the United States Senate upon the pure food question and I ask counsel and the Court to permit me to forego for the present, the cross-examination of Prof. Keiser who is a resident here of the city, whom we can get at most any time, and call Prof. Mallet. I don't know how the Court may feel in regard to this matter or how far your Honor may think you are justified in granting such a request, but I make this appeal both to the Court and counsel for defendant because I do not think it is right that I should have to lose this testimony, as I may, if I am unable to bring Prof. Mallet back here before this matter is submitted.

Mr. Seddon: I will state to the Court that we prefer to have the case proceed in accordance with the regular rules of procedure. Counsel for the State suggested this matter to me yesterday and while I am personally willing that his request be granted yet I took the matter under advisement last night and after consulting with my client, I am requested by my client to state to the Court that we feel that to interrupt the examination in this manner would prejudice our case and therefore we respectfully request that the application be denied. I will state to the Court that if Prof. Mallet is put upon the witness stand now, our examination of him will disclose a line of defense that we think should not be disclosed at the present time and therefore, as I have already stated, we feel that it would be prejudicing our case if the request is granted. I think it will be easy enough to get Prof. Mallet back here whenever Major. Cunningham wants him and I think he will have no difficulty whatever on that score.

The Court: The order in which testimony shall be introduced is a matter of course, governed by well recognized rules of procedure and I think the Court should never inter-

fere unless it is shown that a great injustice will be done one side or the other of the case, and, therefore, I take it that in this case the issues are sufficiently developed by any testimony that we have had so far, to justify me in departing from the regular rules of procedure. Of course I recognize Major Cunningham's position and I will say for the benefit of all of you gentlemen that if Prof. Mallet is not here to testify I will lay the matter over to such time as will give Major Cunningham ample opportunity to produce Prof. Mallet and have him testify.

Mr. Cunningham: Of course, if that is the position of the Court I must submit to it but I still insist that I can not see that any injury will be done to the defendant but I can see that irreparable injury may be done to our case if we are unable to secure the attendance of Prof. Mallet later on.

Mr. Seddon: He is your witness and I think you can get him without any difficulty and I will say to the Court, that as soon as we are through with the cross-examination of Prof. Keiser we have here a witness from Chicago whose testimony we want to take and as he has announced his intention of returning to Chicago to-night and we have no way of keeping him here, I think it is important that we proceed as quickly as possible to examine Prof. Keiser in order that we may put this other witness on the stand before we close to-night.

The Court: I have already stated my position in regard to this matter and I do not believe it is advisable, at this stage of the hearing to interrupt the regular order of procedure but, as I have stated, before I will give Major Cunningham ample opportunity to bring in his witness to give his testimony before the case is finally submitted. You will please proceed with the examination of Prof. Keiser.

Cross Examination.

By Mr. Cunningham:

Q. Prof. Keiser, you stated on your direct examination that you made an analysis of the Layton's Quick Health Food baking powder so as to determine what it was composed of. Will you please state how you made that analysis? A. I began by determining the total carbon dioxide.

Q. You first undertook to determine the total carbon dioxide or carbonic acid gas? A. Yes, sir.

Q. I believe it has been stated here that the object of the baking powder is to produce this carbon dioxide, which causes the bread or other food preparations to "rise" or "puff up," rendering them light? A. Yes, sir.

Q. Now then go on? A. In order to determine the total carbon dioxide I took a weighed quantity of the baking powder. I should state right here that this quantity of the baking powder was carefully weighed on an analytical balance. The quantity of baking powder was then put into a flask or chemical vessel with properly arranged compartments. This vessel had one compartment in which was placed sulphuric acid. In the other compartment was placed dilute hydrochloric acid. As I stated a moment ago the weighed quantity of powder was put into this vessel after which the vessel, together with the powder, was weighed. You see then I had the weight of the quantity of powder and the weight of the vessel with the powder and the necessary chemicals for decomposing the powder. Having everything thus arranged I proceeded by allowing the dilute hydrochloric acid to flow down into the compartment containing the baking powder and as soon as the dilute hydrochloric acid came in contact with the baking powder it see free the carbon dioxide or carbonic acid gas and that gas escaped from that compartment of the vessel throug the sulphuric acid. The object of the sulphuric acid being to dry the gas. After that the apparatus was heated gently on an iron plate and a current of air was passed through the carbon dioxide so as to drive it off. The contents of the vessel were then heated slowly until it was raised to a boiling point the current of air being kept up until all of the gas was driven off, then the apparatus was allowed to cool, after which the whole was carefully weighed on an analytical balance and the loss of weight thus gave us the weight of the total carbon dioxide.

Q. How did you say you ascertained that weight? A. After the carbon dioxide had all been driven off the vessel was allowed to cool and was again weighed. The difference between the weight of the vessel in the first instance, before the carbon dioxide was driven off would give the total weight of the carbon dioxide because that was the only thing that was lost.

Q. The carbon dioxide being the only thing that was driven off the difference in weight represented the weight of the carbon dioxide? A. Yes, sir.

Q. And then what? A. Having the weight of the carbon dioxide it was easy to figure the per cent.

Q. Which you estimated to be in the case of the Layton powder, 10.5? A. Yes, sir; I believe that is the correct amount. I can tell you in a moment (consulting memorandum); yes, the total carbon dioxide in the Layton powder was 10.5 per cent.

Q. Now then what was the next step? A. The next step was to calculate the sodium bicarbonate.

Q. How was that done? A. That is a matter of mathematical calculation because, as I stated before, the ratio between the carbon dioxide and the bicarbonate of soda is forty-four to eighty-four. The co-efficient in that case being 1.909, which might be carried out indefinitely that way.

Q. So then as I understand it having the carbon dioxide you made a direct calculation as to the amount of bicarbonate of soda present? A. Yes, sir.

Q. What does the calculation give you? A. In that case it gave me 20.02.

Q. What was the next process in making this analysis? A. After having determined the total carbon dioxide and the total bicarbonate of soda I next ascertained the per cent of alum present.

Q. Did that involve a chemical analysis or was that done by calculation? A. That was a matter of chemical analysis.

Q. Now let me get this straight. The total carbon dioxide was determined by a chemical analysis? A. Yes, sir.

Q. The total bicarbonate of soda was determined by a calculation based upon the total carbon dioxide? A. Yes, sir.

Q. Now in order that you might arrive at the amount of alum present you undertook another chemical analysis with a view of finding that ingredient? A. Yes, sir.

Q. Please explain to the Court how you made that analysis? A. In this case, as in the other, a weighed quantity of the baking powder was taken—that is to say I took a quantity of the baking powder and weighed it carefully on an

analytical balance after which it was dissolved in hydrochloric acid in a properly prepared vessel, which, in this case, was a tall beaker glass covered with a watch crystal to prevent any loss by ebullition.

Q. How is that? A. The beaker glass was covered with a watch crystal to prevent a loss in bubbling up.

Q. Proceed with the explanation? A. The powder was dissolved in dilute hydrochloric acid and gradually the greater part of the starch goes into solution. The next process then is filtration for the purpose of taking out any impurities that might be present. In this case a little silicious matter was left after the solution had passed through the filter. The amount of that was determined in this way: The filter was carefully washed and dried and after being dried was ignited in a platinum crucible and the weight of the silicious matter was determined. The clear filtrate thus obtained was treated with hydrochloric acid for the purpose of precipitating the alum —

Mr. Cunningham: If you will be kind enough to speak a little louder, Dr. Keiser, I shall be oblige to you as I have a number of witnesses here present, sitting at the end of the counsel table, who wish to hear you. If you find it difficult to raise your voice to such a pitch that they can hear you back there I will have them moved nearer.

The Witness: I find no difficulty whatever in making myself heard and I will speak so that they can hear me.

Q. Please proceed with your explanation? A. Having the solution I next proceeded to precipitate any sulphates that might be present by using barium chloride. The barium chloride being allowed to act until a precipitate is formed. The filter was washed thoroughly, dried and ignited in a platinum crucible and from the amount of barium sulphate present I determined the amount of pure soda alum.

Q. Then as I understand you, your process so far, is a matter of estimate and not a matter of physical determination? A. It is a direct physical determination.

Q. Now, then, go on and explain how you obtained the aluminum hydrate? A. The hydroxide of aluminum was determined by taking a weighed quantity of the baking powder, dissolving it as before, filtering off the insoluble residue and then adding ammonia to neutralize the excess hydrochloric acid present. It is then heated to a boiling point until

the odor of the ammonia is no longer perceptible and the aluminum hydrate is precipitated in a white flocculent precipitate, after boiling off the excess of ammonia the whole was then filtered after which the filter was washed thoroughly and carefully dried after which it was ignited in a platinum crucible and I determined the amount of aluminum hydrate present.

Q. What was the next step of the analysis? A. The next step was to determine the amount of the sodium oxide.

Q. How did you proceed with that? A. I first took a quantity of the baking powder, weighed it carefully on an analytical balance, as before, after which it was placed on a platinum dish properly muffled and the starch burned off. A white ash was left which was dissolved in dilute hydrochloric acid and then filtered, after which we have in the solution oxide of sodium, oxide of aluminum, sulphuric acid and hydrochloric acid. I then added carbonate of barium to carry down the sulphate and the alumina and then we have left nothing but the sodium chloride in the solution that remained. In order to remove any compound of barium that might remain a stream of carbon dioxide was passed through, after which the solution was filtered and the filtrate was carefully dried, and ignited and the weight of the sodium chloride was thus obtained.

Q. You first had the total carbon dioxide after that you got the amount of alum, then you got the total sodium? A. Yes, sir; I also determined the amount of the aluminum hydrate present.

Q. Now what was left? A. The only remaining step was to determine the amount of starch present.

Q. How did you do that? A. In some cases I made a direct determination.

Q. How did you do that? A. I did that by taking the weight of a given quantity of the baking powder and treating it with dilute hydrochloric acid to change the starch into sugar. After that I filtered off the insoluble matter and determined the amount of sugar with the polariscope. That is one method of determining the amount of starch present.

Q. What was the other method? A. The other method was to take a weighed quantity of the baking powder, dissolve it in cold water, filter it off, wash it thoroughly with cold water, dry the residue and now we have the starch plus the

aluminum hydrate. As we have the aluminum hydrate and the starch, I burn off the starch after it has dried at 110 degrees in the air bath and weighed which leaves me the aluminum hydrate. I then subtracted the weight of the aluminum hydrate which leaves me the weight of the starch. I have thus outlined the method which I used in making these analyses.

Q. How did you determine the amount of bicarbonate of soda present? A. I determined that after having ascertained the total carbon dioxide.

Q. That is what I asked you, how did you determine it? A. I determined that by calculation.

Q. That is what I am trying to get at. How did you make that calculation? A. It is a well known fact in the science of chemistry that eighty-four parts of pure bicarbonate of soda contain forty-four parts of carbon dioxide. As I stated before, having ascertained the weight of the carbon dioxide, or the quantity of the carbon dioxide to be 10.5 per cent we would have the proportion: 10.5 is to x as 44 is to 84—that is to say if the carbon dioxide is 10.5 per cent the ratio would be as 10.5 is to the unknown quantity of bicarbonate of soda as 44 is to 84. When that proportion is figured out you will find it to be about 20.02.

Q. You stated that coefficient in that case I believe? A. Yes, sir; it is 1.909 which might be carried out indefinitely.

Q. Now, Doctor, in one of your answers a few moments ago you said that 84 parts of pure bicarbonate of soda contains 44 parts of carbon dioxide. How much carbon dioxide is found in the bicarbonate of soda of commerce, or as we term it, commercial bicarbonate of soda? A. I can best answer that question by stating that I made an analysis of bicarbonate of soda that was furnished me by the baking powder manufacturers and I found it contained 1.4 of insoluble matter which would leave 98.6 of pure bicarbonate of soda so that the proportion would be 84 is to 44 as 98.6 is to x.

Q. Then it would not give you as large a quantity of caron dioxide as it would if the bicarbonate of soda was pure? A. There would be a loss of the amount of carbon dioxide contained in the 1.4 per cent.

Mr. Seddon: That would be about one-half of one per cent.? A. Yes, sir.

The Court: Did you make an analysis of only one sample? A. Yes, I was only asked to examine one sample.

Mr. Cunningham: Now if there have been any more approximations and not exact ratios there would be some errors in your proportions would there not? A. I don't understand what you mean. I gave you exact ratios; I did not assume anything.

Q. I understood in speaking of the bicarbonate of soda in your calculations your estimate was based upon pure bicarbonate of soda, where, according to your analysis of a sample of bicarbonate of soda you found 1.4 per cent of insoluble matter, leaving 98.6 pure bicarbonate of soda. Now then if your calculation is based upon commercial soda instead of pure bicarbonate of soda would not those calculations result in an error in that it would give you an excess of carbon dioxide over what you would actually get from the commercial bicarbonate of soda? A. I hardly understand what you are getting at, but the estimate I made was based on pure bicarbonate of soda.

Q. Then if as a matter of fact commercial bicarbonate of soda is only 98.6 pure your calculation is thrown out entirely is it not? A. Well, the difference would hardly be appreciable. These results are not approximations. They are the mean of duplicates.

Q. Now, Doctor, in determining the constitutents of baking powder did you take into consideration the water or moisture, or was there any water or moisture, how about that? A. There is always more or less moisture in starch. It is never absolutely dry. I made no separate determination of that.

Q. How then could you tell how much starch there was in the baking powder? A. By the method I have described the result gave me the starch as it existed in the baking powder.

Q. With the water and all in it? A. I told you the starch was dried in an air bath at 110 degrees.

Q. Is the starch that is put in the baking powder dried in an air bath at 110 degrees? A. I am not familiar with the operation of making baking powder—that is to say I do not know what they do in that regard.

Q. How do you know then how much starch there was in the baking powder? A. I explained to you that I took a weighed quantity of the baking powder and treated it with dilute hydrochloric acid to change the starch into sugar after which I filtered off the insoluble matter and determined the amount of sugar with the polariscope.

Q. I think you described another method there too. what was that? A. The other method was to dissolve a given quantity of the powder carefully weighed, in cold water, filter it off, dry the residue and then we have the starch plus the aluminum hydrate, after which the starch is dried at 110. degrees in an air bath, then burned off leaving the aluminum hydrate. The weight of the aluminum hydrate then being subtracted leaves the weight of the starch.

Q. Then as I understand it you made no separate determination of the amount of moisture present and therefore it is a matter of approximation and not a matter of direct determination? A. It is a matter of direct determination.

Q. I don't see how you get that? A. The weight of the aluminum hydrate has already been determined and when you have the weight of the starch plus the aluminum hydrate a subtraction of the aluminum hydrate leaves the exact amount of starch and that is not an approximation.

Q. It leaves the starch with the moisture in it, doesn't it? A. I have already stated that I made no separate determination of the moisture.

Q. I did not ask that, Doctor. My question was that it gave the total amount of starch plus the moisture? A. Yes, sir; as no attempt was made to determine the amount of the moisture.

Q. Now, Doctor, I want to go back to your first statement regarding the results of these analyses and get you to repeat them in order that I may take them down so as to avoid any mistakes concerning them. A. I have the figures before me. The total carbon dioxide is 10.5, the sodium bicarbonate is 20.02, the sodium alum is 20.4, starch and insoluble matter 59.58.

Q. Now, then, taking those figures and adding them together, allowing 59.58 for starch and insoluble matter you make up the entire weight of your baking powder? You have not accounted for any water? A. I stated I made no separate determination to ascertain the amount of water.

Q. Then you don't know? A. I made no determination.

Q. Now, isn't it true, Doctor, that you don't know. A. That matter could be determined very easily.

Q. That is not the question, Doctor. The question is you do not know as a matter of fact, do you? A. No, I do not know, but I can ascertain.

Q. You do not know now do you? A. No, I do not know now.

Q. So if your analysis foots up 100 per cent you have never accounted for the water? A. No, it was not accounted for.

Q. You have not accounted for it anywhere? A. It is in the starch.

Q. You say it is in the starch so that the total starch of the compound is the actual starch plus the water? A. The water is not material here, and therefore I made no separate analysis to determine it.

Q. That is not the question. It is not a question here of whether it is material or not but it is a question of fact. You made no determination of the amount of the water therefore, you do not know what amount it contained. A. I made no separate determination because it was not material It was of no consequence.

Q. Then it is true that you do not know? A. It is true.

Q. And the same answer is true of all the other powders that you analyzed? A. What do you mean?

Q. I mean that you do not know just how much starch was in any one of them? A. You will find that all of the results do not add to 100. In cases where they do not add to 100 the balance might be moisture.

Q. I was looking over some of these results and in some cases they add up I think beyond the 100? A. I do not think you will find any that go beyond 100.

Q. Did I understand you to say in your direct examination that you obtained or determined anything by differences? A. What is that?

Q. Did you say in your direct examination that you determined any of these substances by differences? A. I think I have stated to you several times that I determined

them directly and gave you the methods by which they were determined.

Q. Didn't I understand you to say in some cases you approximated them? A. Where I used any calculation it could hardly be termed an approximation because the proportion is so well known that the result could not be said to be an approximation.

Q. You used a calculation to determine the amount of bicarbonate of soda? A. Yes, sir.

Q. And in some cases you determined the amount of starch by differences? A. In some cases it was obtained that way, but in others I made a direct analysis as I have already described.

Q. Are you prepared to state that these analyses of yours and the results you have shown here represent the substances which were put into these baking powders when they were made? A. No, I didn't say that. The results represent what I found in the baking powders when I analyzed them.

Q. Now, Doctor, you said, or rather I will ask you if you know whether commercial soda alum contains any moisture—water? A. I have an analysis of a sample of the soda alum handed to me by the baking powder manufacturers and I can give you the result of my analysis of it.

Q. Will you please state the result? A. Yes, I found—

Q. First let me ask you was this commercial soda alum, as it is called? A. Yes, it was soda alum furnished by the manufacturers of baking powder.

Q. Now go on and state what you found? A. I found sulphate of alumina, 71.34. I found sodium sulphate, 29.93. I also found insoluble matter, .77.

Q. That is the analysis that you made? A. Yes, sir.

Q. Did you make any determination of the moisture? A. No; nothing further than I have already given you.

Q. This does not give any water at all? A. I have stated that I made no separate determination of the water.

Q. I understood you to say that several of the elements, I do not mean in a chemical sense but I mean relating to a question of percentage, amounted to 100. That indicates all that there is in the substance does it not? A. If it foots up to 100 it would indicate everything.

Q. If it was something less than a hundred it would leave something to be accounted for? A. Yes, sir.

Q. Now you have given us 71.34 and 29.93 and .77. If you will add those up it will give you something beyond a hundred will it not? A. I thing that should be 27.93. The light is a little bad here and these figures are somewhat dimmed.

Q. Well, take it at 27.93 and 71.34 and add to that .77. That gives you how much? A. It gives you 100.04.

Q. That is beyond a hundred then? A. I must have made a mistake in adding that up because I got 99.44 which gave something to account for water.

Q. But here then you have a percentage in which no water is accounted for? A. I made no estimate of the water in it.

Q. Did it go in with the insoluble matter? A. Well it would have to go in that way because that is the only place we could put it.

Q. You found the place for your sulphate of alumina? A. Yes, sir.

Q. And you also found a place for your sodium sulphate? A. Yes, sir.

Q. Now then, you allowed .77 for insoluble matter? A. Yes, sir.

Q. That gives you a little beyond a hundred? A. Yes, but I will state by way of explanation that it is impossible to get these things down absolutely but the variations are only in hundredths and are not considered. When I speak of a result as being absolute I mean that it is as near absolute as human investigation can make it. I might analyze a substance and record my figures and then make a second analysis and I may have a variation in the hundredths yet both would be considered absolute.

Q. Doctor, did you say that commercial alum—commercial soda alum, as it is called, has no hydroscopic moisture? A. I made no investigation of commercial sodium alum at all for that purpose.

Q. Doctor, what is the acidity of commercial soda alum? A. The acidity?

Q. Yes; what is the acidity of commercial soda alum? A. I made no determination of that whatever.

Q. Do you know what it is? A. No, sir.

Q. Can you describe the process of manufacturing soda alum? A. No, I have never been at the works where it is manufactured.

Q. That is not the question. I asked you if you knew anything about the process of manufacturing soda alum? A. I have never been at the works where it is made and therefore I can not speak with any definiteness regarding its manufacture.

Q. Do you know as a matter of scientific investigation? A. I can make it in a laboratory.

Q. I am speaking of the method of manufacturing commercial soda alum? A. I know nothing about the actual manufacture of commercial soda alum. I know how to make it in a laboratory.

Q. But how it is made as a matter of fact for commercial purposes you say you know nothing? A. I know nothing about that.

Q. Do you know whether or not in commercial soda alum acidity is a constant quantity? A. If you will define the term "acidity" I will then know what you mean.

Q. I will put the question to you as a chemist. I ask you to answer it in that light? A. The word "acidity" is like a great many other chemical terms. It is difficult to determine and therefore I say I can not answer unless I know what your idea is—that is—what you mean by the term "acidity."

Q. You can answer that question in whatever sense the word "acidity" can be taken or has been used in literature or treatises on scientific subjects? A. No, I can not answer that question in regard to commercial alum because I made no examination as to the acidity of commercial alum.

Q. Doctor, you stated in your direct examination that when alum baking powder and flour are mixed together with water to form a dough and the whole is subjected to heat the products resulting from the reaction of the constituents of the baking powder have none of the qualities or properties of the original substances used in making the baking powder? A. I answered substantially as you have stated it.

Q. Will you please explain what you mean by the statement? A. I mean by that statement that the alum is destroyed as alum and the substances which result from the chemical reaction are new substances entirely having none of

the properties of the original alum. The original alum is gone and new substances are formed.

Q. Explain the difference? A. Well, in the first place aluminum hydrate is a white insoluble matter and sodium sulphate is slightly white in color and the two substances I have mentioned are entirely different from the original substances.

Q. And you say they have none of the properties or qualities of the original substance? A. No, sir; the substances are separate and distinct substances just as iron and sugar are separate and distinct substances. They are new compounds having new properties.

Q. What are the properties of alum, Doctor, as regards its action upon the mucous membrane in the animal system? A. I have made no examination into that question.

Q. Do you know? A. Only in a general way.

Mr. Seddon: I object to this line of examination on the ground that this witness has not qualified as a physiologist, but as an expert on chemistry and these questions are questions in physiology and not in chemistry.

The Court: Has this witness qualified as an expert in physiology?

Judge Seddon: No; only as an expert in chemistry.

Mr. Cunningham: I ask these questions on this theory: The witness has stated that when the chemical reaction takes place the alum disappears and new substances are formed having different properties or qualities entirely. That is a very broad statement and in my inquiry as to what he knows about it I think I have a right to go into the question as to what effect or action these different substances would have on the human body. Now if he knows that alum has a certain effect I want to know from him if aluminum hydrate has a different effect. How can he tell that the qualities are all different unless he knows what properties or qualities they possess. It is the only fair way to cross-examine him in view of his testimony.

The Court: I certainly understood that this witness qualified as an expert in chemistry and he stated in answer to your questions that these new substances possess different properties or qualities from those possesed by the original alum. Now if you ask what effect these different substances have on the human body it seems to me you are going beyond

his qualifications as a chemist and getting into the range of medicine. It seems to me that it is a question for an expert in medicine to determine what effect thes different substances would have on the human body. I understood that he spoke of them from the standpoint of a chemist when he said that their qualities or properties are different. As he has not qualified in physiology he will not go into that subject with this witness.

Mr. Cunningham: Do you know all of the properties of alum? A. No, sir.

Q. Do you know all of the properties of hydroxide of aluminum? A. No, sir.

Q. Then why do you say that the alum and the products resulting from the chemical reaction do not have the same properties? A. I speak of them from a chemical standpoint.

Q. What do you mean by that? A. I mean their chemical behavior as we ordinarily use that term. In that sense of the word the resulting products have different properties or qualities from the original alum. You can find these properties given in any standard work on chemistry.

Q. Then when you speak of them as having different properties or qualities you mean from a chemical standpoint? A. Yes, sir.

Q. And you do not know what properties or qualities they might have from a medical standpoint? No, sir; I am not qualified to speak of them from that standpoint.

Q. Doctor, do you know whether or not alum is an astringent? A. I have made no experiments in that direction.

Q. Did you ever taste it? A. Yes, sir.

Q. What is the taste? A. It has a very bitter taste.

Q. Is it not astringent? A. I believe alum is so regarded.

Q. Then would you say to your knowledge that alum is an astringent?

Objected to on the ground that this witness has not qualified as an expert in medical matters.

Mr. Cunningham: I merely asked the witness if he knew of his own knowledge if it was an astringent.

Mr. Seddon: I submit that this is a question to be answered by an expert in medicine and I therefore object on

the ground that the witness has not qualified on those subjects, and therefore is not competent to speak as to whether it is astringent or not.

The Court: I will let him answer the question and I will consider his testimony in the light of all of his qualifications.

Mr. Cunningham: I will get you to state whether or not of your own knowledge alum is an astringent? A. I should say it is an astringent.

Q. Is solubility a chemical quality or a physical quality? A. When you speak of chemical qualities what do you mean?

Q. Well, I could use that from a standpoint of a chemist? A. It is pretty hard to answer the question just the way you put it.

Q. Well, I will get at it this way; Doctor, is alum soluble? A. In what?

Q. Is alum soluble in anything? A. Yes.

Q. In what? A. In water.

Q. Is alum soluble in anything else? A. I know of nothing else at the present moment in which alum is soluble. It is not soluble in the ordinary solvents such as pure alcohol, ether, chloroform, acetone or benzole and in fact a great many other substances.

Q. Now, Doctor, is hydrate of aluminum, which is one of the results of this chemical reaction soluble? A. Soluble in what?

Q. Is it soluble in anything? A. Yes, it is soluble in the acids.

Q. In what acids? A. In the ordinary acids?

Q. What are the ordinary acids? A. Well, I refer to hydrochloric acid, sulphuric acid and others of that kind.

Q. Those are the ordinary acids you mean? A. Yes, sir.

Q. Is it soluble in any other acids besides the ordinary ones? A. Yes, sir.

Q. What other acids is it soluble in? A. It is soluble in acetic acid for instance.

Q. Is it soluble in any other acids besides those you have already mentioned? A. Yes, I could give quite a number of acids if I had time to think about it.

Q. Now, then, as I understand it hydrate of aluminum

is soluble as you term it in the ordinary acids? A. Yes, sir.

Q. Now, Doctor, I will ask you if you know the composition or the acknowledged composition of the gastric juices of the human stomach? A. I know nothing about them.

Q. Absolutely nothing? A. I never had any practical knowledge of that subject and I only know of those things in a general way.

Q. Now, then, I will ask you what you know in a general way on the subject?

Mr. Seddon: We object to this line of examination on the ground that this witness is not an expert on the gastric juices of the human stomach and it is purely a question of physiology and not of chemistry.

The Court: The witness may answer whether he knows or does not know.

The Witness: I have no knowledge on that subject that would throw any light on the controversy.

Mr. Cunningham: Now, Doctor, are you speaking of knowledge derived from your information or from actual tests or experiences that you have had, when you say you have no knowledge on the subject, except in a general way. A. I have no knowledge on the subject of the composition of the gastric juices of the body because that lies outside of my domain in chemistry. I never looked into that matter at all as it is a matter that concerns the physiological chemist and I never went into that department of the science. That is what I mean when I say that I can not give you any information on the subject that would be of value to you here.

Q. I am not asking you to be the judge of the value of your testimony, Doctor; the question is, do you know anything about the composition of the gastric juices, the gastric juices or secretions of the human stomach? A. I have stated I have never gone into that subject at all.

Q. Could you tell me how the compositions of the gastric juices and secretions of the stomach are determined—that would be a chemical question would it not? A. I never made any such determination.

Q. How is it determined, Doctor? A. I do not know how it is done.

Q. I understand you to say then that you do not know what are the usually accepted contents, or rather what is the

usually accepted composition of the gastric juices of the human stomach? A. I do not know.

Q. You do not know that as a matter of general information? A. No, sir.

Q. Please speak up, Doctor; I am having some difficulty in hearing you? A. I do not know the composition of the gastric juice.

Q. Doctor, do you know whether or not hydrochloric acid exists in the gastric juices of the human stomach. A. I do not.

Q. What do you mean by that answer. A. I mean by that I do not know whether it exists in the gastric juice of the human stomach or not.

Q. Do you know whether aluminum hydrate is soluble in lactic acid? A. I never tried the experiment.

Q. You stated in answer to one of my questions that it was soluble in nearly all of the ordinary acids? A. Yes, sir; I made that statement.

Q. Yet you are not now able to state whether it is soluble in lactic acid or not? A. I never tried the experiment of dissolving it in lactic acid.

Q. What should be the properties of the compound formed by the action of lactic acid on aluminum hydrate. A. The chemical properties which would form would be those of an aluminum lactate.

Q. Soluble in what? A. It would readily decompose or be soluble in most of the ordinary acids.

Q. Now, Doctor, if aluminum hydrate is brought into a solution containing sodium sulphate, lactic acid and muriactic acid what would take place—chemically speaking. A. You mean what would take place if you introduced hydrate of aluminum into a solution containing sodium sulphate, lactic acid and muriatic acid.

Q. Yes? A. It would depend upon the temperature and pressure.

Q. Take normal temperature? A. It would be difficult to state just what the result would be without specific conditions.

Q. What would the result be at ordinary pressure and ordinary temperature? A. As I stated a moment ago it is difficult to give the result without specific conditions because there might be a great difference between dilute solution.

Q. Take a solution to fit the taste, mean temperature and ordinary barometric pressure? A. Now give me the strength of the solution?

Q. Construct a solution to suit any taste? A. Introduce aluminum hydrate into a solution containing sodium sulphate, lactic acid and hydrochloric acid. Well, in the first place the muriatic acid and the sulphuric acid would seize the strongest base, which is the sodium. They would part the sodium between them and what was left of these two acids, together with the lactic acid would dissolve the aluminum hydrate.

Q. Now let me get that as you go along. You say that the sulphuric acid and the hydrochloric acid would part the sodium between them, the sodium being the strongest base, and if there was anything left of these two acids they, together with the lactic acid would dissolve the aluminum hydrate? A. Yes, sir.

Q. Now go on with the explanation? A. Now if the solution was very dilute you would have no salts present as such but these salts instead of being present in that condition would be resolved into their "ions" and you would then have free sodium ions. Free aluminum ions. Ione of sulphuric and hydrochloric acids. Also of the lactic acid.

Q. That would occur if the solution was dilute? A. Yes, sir; they would be present in that condition.

Q. If the solution is weak you have the salts in a dissociated condition—resolved into their "ions" you say? A. Yes, sir; you would probably have some aluminum sulphate and probably an aluminum chloride. As I say if the solution was dilute you would have no combination whatsoever of these substances but they would be present in a dissociated condition and that the salts would be resolved into their "ions" as I have already stated.

Q. Speak a little louder, Doctor; I did not hear your answer? A. I say you would probably have some aluminum hydrate, aluminum sulphate and aluminum chloride. I say if the solution was dilute you would have no combination whatever of these substances but they would be present in a dissociated condition and the salts would be resolved into their "ions."

Q. That result would occur only if the solution was dilute? A. Yes, sir.

Q. Is it not a fact, Doctor, and do you not know that in accordance with the laws of chemical equilibrium and mass action, aluminum sulphate would form and a mixture of aluminum sulphate and sodium sulphate would exist in the solution? A. I have already stated in answer to part of your question that we would probably have an aluminum sulphate in the solution.

Q. Then I will ask you whether or not, as a consequence of what you have just stated, would you not have a solution of aluminum sulphate and sodium sulphate; the constituents of alum? A. Yes, sir.

Q. The solution would be exactly the same as a solution of soda alum? A. Yes, sir.

Q. Now, Doctor, in the aqueous extract which you spoke of in your direct examination did you expect to find any aluminum or its compounds? A. I expected to find alum in the aqueous extract and I tested it for free alum.

Q. You say that you tested it for free alum? A. Yes, sir.

Q. Did you find any? A. No, sir; I found none.

Q. You say you expected to find it? A. Yes, I looked for it.

Q. Did you expect to find it in any great quantity? A. No, not in any great quantity. I expected to find it in a small quantity.

Q. How did you test for its presence. I believe you have stated the method by which you made the test. Will you please explain how you tested for its presence or absence? A. By filtering the solution, adding ammonia hydrate and allowing it to be heated to the boiling point and then to stand for twenty-four hours. If there had been any alum it would have been precipitated and I would have been able to see it especially on agitating the vessel, I could have seen it passing up through the liquid.

Q. Finding no such precipitate you concluded that there was no alum present? A. Yes, sir; I concluded that there was none present.

Q. How did you determine the amount of the ammonia that had been added to make this test? A. In making the test I added ammonia until on stirring it up there was a faint odor of ammonia and then when heat was applied I continued boiling it until I could no longer notice the odor of ammonia.

Those are the best conditions for precipitating the aluminum that might be there.

The Court: If there was any aluminum present in the solution, what would be the result? A. If there was any it would be precipitated in the form of a white flocculent precipitate at the bottom of the vessel.

Q. What would that precipitate be? A. Aluminum hydrate.

Mr. Cunningham: Now, Doctor, in the aqueous solution, you say you filtered it to get rid of any organic matter, or in other words, you removed by filtration, through a parchment paper any organic matter that might remain. A. I used a parchment paper filter which would keep back any organic material that might interfere with the precipitation of the aluminum compounds.

Q. Do I understand that the organic matter would not pass through while the aluminum compounds would pass through very readily? A. Yes, they have the power of diffusion and the organic matter remains behind.

Q. Is it true, Doctor, that the aluminum compounds become dissociated, pass through the parchment filter and leave all of the organic matter behind? A. Only the aluminum compounds would pass through, the organic matter would remain behind.

Q. Do you know that in the aqueous extract those compounds would free themselves from everything else and pass through the filter leaving the organic matter behind? A. Are you speaking now about aluminum compounds?

Q. I said would all of the aluminum compounds in that solution free themselves and pass through the filter so that the solution would then contain nothing but the aluminum compound? A. My statement is that by that process of filtration you would secure all of the alumina that might be in the solution and none of the organic compounds.

Q. Then as I understand it the constituents of any aluminum would free themselves and pass through the filter and the organic matter would not? A. I will state to you that I did not test the solution for any organic matter after I filtered it. I then tested it only for aluminum compounds.

Q. Do you know whether as a matter of fact the organic matters would be held back, whether soluble or in-

soluble. I mean would they pass through or not? A. What do you mean by the term "organic matter"?

Q. Well, now, isn't that a term well known and understood by chemists. I mean organic matter as distinguished from inorganic matter. I have tried to put this question to you in a way that I assume you, as a chemist, would understand it. Of course I am not a chemist and I am sometimes at a disadvantage in framing these questions but I have, with the assistance of others, endeavored to put these questions to you in such a way that you as an expert chemist would understand them. A. Well, I don't know exactly about that term organic and inorganic. There seems to be a great difference of opinion between matters that are considered organic and matters that are considered inorganic, as the terms are used in a general way.

Q. I can only ask you as an expert whether or not any organic matter would pass throug or would it all remain behind? A. Well, if you will mention something, propably I could tell better. I want to answer the question fairly but you use a broad term when you say organic matter. I do not like to answer such a sweeping question, yes or no.

Q. Would sugar pass through? A. Yes.

Q. That is an organic substance? A. Yes, sir.

Q. Did you ever see soluble aluminum hydrates produced by diffusion? A. Yes, sir.

Q. How is it produced? A. The details of the experiment are recorded but I myself can not give the exact conditions. Graham, the eminent English chemist, found many of these soluble compounds were formed under certain conditions and those conditions have been described in the reports and I think have been described as soluble aluminum hydrate.

Q. Does the aluminum hydroxide pass through or remain behind? A. I think it would pass through.

Q. You say that you think that it would pass through? A. Yes, sir; and if you will allow me I will explain why I answer that way. I say it will pass through and by that I mean there might be present sufficient quantity of organic matter to hold back some of the aluminum hydrate.

Q. Might not the organic matter hold back the alum also? A. No, sir; the alum would pass through freely.

Q. You say none of the alum would be held back but

that the presence of organic matter might hold back some of the aluminum hydrate? A. If there was a sufficient quantity.

Q. I am now talking about your test with the ammoniacal solution? A. I say that the alum would pass through and as none did pass through there was no doubt in my mind that none was present. If any had been present it would have been precipitated.

Q. The question now is would the organic matter have held back any of the alum at all? A. I answered that by saying that I think not. I will say if there had been a very considerable quantity of organic matter it might have held back a portion.

Q. How considerable a quantity would have been necessary to hold back any of it? A. I should say from ten to fifteen per cent of it. To hold back the aluminum hydrate or any appreciable portion of it.

Q. Now will you please state Doctor, you may have stated it before but I do not now recall it and will get you to state it again, how you proceeded to analyze the acid extract that you made from the Layton bread, and by that I mean the bread that you yourself made from the Layton baking powder? A. The acid was neutralized with ammonia, then the solution was boiled until the odor of ammonia was gone, after which it was allowed to stand for twenty-four hours. The aluminum hydrate in that was filtered off, washed, dried, ignited and weighed as hydrate aluminum.

Q. Was that solution warm or cold? A. It was cold. It was allowed to stand forty-eight hours so that it was thoroughly digested.

Q. I am speaking of it now with reference to when it was first made? A. It was cold.

Q. Are there any mineral constitutents naturally present in the flour which the hydrochloric acid would have extracted and which would have been precipitated along with the aluminum hydrate? A. In wheat flour aluminum phosphate has been found so that in bread raised with yeast, and in which no baking powder was used at all, aluminum phosphate has been found, so that it must be present in the flour.

Q. Do you say that it always occurs in the flour? A. Not always. I did not make any analysis of the flour but I have stated heretofore that, in determining the aluminum

hydrate, I found that I had more than would be accounted for in that quantity of baking powder and therefore conclude that it must come from the flour itself.

Q. How is that? A. I stated that when I made the calculation in regard to the quantity of hydrate of aluminum I found that I had more than I could account for in that quantity of baking powder. I had ten and a fraction grains, when, as a matter of fact, the maximum from that quantity of baking power was eight and a fraction grains giving in round numbers an excess of two grains and this excess must have come from the flour.

Q. Now are there any other constituents in the flour that might have been precipitated along with that aluminum hydrate, besides the phosphate? A. Perhaps a trace of iron. I did not suspect the presence of any other constituent. If iron had been present it would have shown color.

Q. Might there not have been some calcium or magnesium phosphate present? A. At best there could only have been a trace.

Q. Do you not think that there could have been more than a trace? A. I do not think there could have been more than that.

Q. Did you endeavor to separate such constitutents, I am speaking now of the calcium and aluminum phosphates from the aluminum hydrate? A. No, sir; and I will say in that connection that probably some of the excess aluminum hydrate I found, I reported it, as I stated a moment ago, at ten annd a fraction grains, and the maximum I could figure out from that amount of baking powder was eight and a fraction grains, making an excess of two grains which might be accounted for in that way.

Q. Some of that may have been calcium phosphate? A. It might.

Q. And some of it might have been magnesium phosphate? A. Probably.

Q. Now as to that being an ultimate fact you do not know? A. No, sir.

Q. Then you do not know, Doctor, and you can not tell us yes or no upon that proposition? A. I can not state how much calcium or magnesium phosphate was there nor can I state whether there was any or not as I made no attempt to determine that fact.

Q. Now, Doctor, I understood you to state in your direct examination that the weight of aluminum hydrate obtained from the hydrochloric acid extract amounted to .16 of one per cent of the weight of the bread that you made? A. Yes, sir.

Q. And in round numbers is equal to ten grains? A. Yes, sir.

Q. Ten grains to fourteen ounces of the residuum from the baking power put into the bread, and in per cent, you found the aluminum hydrate to amount to 16-100 of one per cent of the weight of the loaf of bread? A. I will have to request that you repeat that question.

Q. In the residuum from the baking powder put originally into the bread, you mean that you found aluminum hydrate amounting to 16-100 of one per cent of the total weight of the bread? A. I did not put any residuum from the baking powder into the bread. I put in the baking powder itself.

Q. Perhaps you do not understand the question from the way I frame it. I did not mean to say that you put the residuum from the baking powder into the bread. What I intended to say was that of the residuum left from the baking powder that originally went into the bread you found that 16-100 of one per cent of the weight of the bread was aluminum hydrate? A. Yes, sir.

Q. Now did the aluminum hydrate from the baking powder in the bread appear in the hydrochloric extract? A. If you will allow me to explain, perhaps I can make myself clear. I found 16-100 of one per cent of the aluminum hydrate, which is about ten grains in the 14 ounce loaf of bread. Calculating from the amount I should have found in the two per cent baking powder I found I had an excess of about two grains. That is to say I found a little more in the hydrochloric acid extract than I found in the quantity of free alum which I knew to be present in the baking powder, but I will say that I even did not find a trace of free alum itself in the hydrochloric acid extract.

Q. Whatever it was you found it there and called it aluminum hydrate, whether there was in it any calcium phosphate or any magnesium phosphate you do not pretend to say? A. No, sir; I made no separate determination of anything of that kind.

Q. Now do you know as a matter of fact whether or not there was any aluminum phosphate in the flour? A. I made no analysis of the flour at all.

Q. Do you know? A. No, sir; I made no analysis so I can not tell.

The Court: Do I understand that your experiments were conducted with bread in which you put no seasoning at all—nothing like salt or any seasoning that is usually put into bread to render it palatable? A. No, sir; I put in nothing but the flour and baking powder.

Q. If you had put in salt and a little sugar such as is often used in making bread would that have made any difference in the result? A. No, sir; the products from the reaction that took place would have been the same.

Q. You think that the addition of neither sugar nor salt would have effected the result one way or the other? A. No, sir; I do not.

Q. However you used only the flour and baking powder and sufficient water to make a dough? A. Yes, sir.

Q. Would the addition of any lard have made any difference? A. I think not—I know it would not.

Mr. Cunningham: Doctor do you state positively that it is impossible that any aluminum compound might be present in the aqueous extract of the bread and not held back by the parchment filter you employed? A. I will have to get you to put that question again.

Q. Doctor, do you state that it is impossible that any alumina compound might be present in the aqueous extract of the bread and not held back by the parchment filter you employed? A. That question is so involved I would like to have it read slowly to me so that I may understand it.

(Qestion as repeated), Doctor, do you state positively that it is impossible that any alumina compound might be present in the aqueous extract of the bread and not be held back by the parchment filter you employed. I want you to answer that question yes or no? A. Would yes or no to that proposition mean that it is or that it is not held back? The question is so involved I am frank to say I do not know which way you want it answered.

Q. I want it answered yes or no? A. I will say yes and by that I mean that it is impossible that any alumina

compounds could have been held back by the parchment filter I employed.

Q. Perhaps I can make my meaning a little clearer by putting the question with a word omitted. Do you state positively that it is impossible that any alumina compound might be present in the aqueous extract of the bread and be held back by the parchment filter you employed. Perhaps that does not make it so involved. What I mean to say is do you state that the parchment filter you employed could not hold back any of the soluble alumina compounds that might be present in the aqueous extract? A. It could not hold them back—In other words they would pass through.

JOHN C. CHAPMAN, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. John C. Chapman.

Q. What is your business? A. I am engaged in the manufacture of baking powder and kindred articles.

Q. What is the name of your company? A. The Chapman & Smith Company.

Q. How long have you been acquainted with the baking powder business and associated with it? A. Since 1871.

Q. What attention have you given to it during that time? A. I have been employed in the manufacture and selling of baking powder ever since. I was first employed by others and finally went into the business of manufacturing it on my own acount.

Q. Do you know anything about the different classes of baking powders on the market? A. Yes, sir.

Q. How many different kinds have we? A. We have three that are recognized as standard. The cream of tartar, which is cream of tartar, tartaric acid, bicarbonate of soda and starch. Then we have what we call the alum powders, one being the straight alum powder, which is composed of bicarbonate of soda, starch and soda alum and finally we have what we call the alum phosphate powders, which are

composed of bicarbonate of soda, alum and acid phosphate of calcium.

Q. Those are the three principal brands? A. Yes, sir.

Q. In your business career have you become acquainted with the history of the baking powder business? A. Yes, sir.

Q. Will you give us some idea of the amount of the trade in baking powder in the year?

Objected to on the ground already stated in the general objection heretofore entered to any testimony in this case and further that this testimony is incompetent, immaterial and irrelevant for any purpose whatsoever.

The Court: I will take it subject to your objection.

A. I should say that the annual sales amount to between eighty-five and ninety millions pounds a year.

Q. What kind? A. Alum and alum phosphate powders comprise the larger part.

Q. How extensive is the trade in the so-called alum baking powder? A. The trade extends throughout the United States and the dominion of Canada.

Q. Is it a part of your business to keep up with the trade? A. Yes, we aim to do so.

Q. How long have the alum baking powders been manufactured and sold? A. The first alum baking powder that ever came to my notice was the Ocean brand manufactured and sold by the Royal Chemical Company in 1872 or 1873. Since that other baking powders have appeared on the market made of ordinary commercial alum, bicarbonate of soda and starch. I next heard of a brand manufactured by Clogsworthy under the name of Patapsco. That was burnt alum, bicarbonate of soda and starch.

Q. I don't care about the detailed history of the different brands. I wish you would give me a brief outline of the trade during the time you have been identified with it. When did alum baking powder first come into the market? A. Well, they first came into the market along in the early seventies but they began to attract general attention and to be recognized as an article of commerce, generally speaking, about 1879. It was soon after that that the cream of tartar people commenced to advertise very extensively and create a great prejudice against the alum powders on the ground

that they were unwholesome. I think for a little while it did hurt the trade but it recovered shortly and since then there has been a steadily increasing demand for alum and alum phosphate baking powders, and since that time the trade has grown to enormous proportions and it is now recognized as one of the best baking powders in use.

Q. That prejudice has disappeared? A. Yes, sir.

Q. Will you please state what class of baking powder you manufacture and sell? A. We manufacture principally alum phosphate powder. It was sold for a good many years under the name of the Chicago Yeast Powder but as the courts the name of Chapman's baking powder. It was first put up under the name of the Chicago Yeast Powder but as the courts decided that we had no exclusive right to the use of that name we protected ourselves by changing the name to Chapman's baking powder.

Q. Do you sell it as an alum powder? A. Yes, sir; we sell it for what it is.

Q. What has been your experience as to the satisfaction it gives the public and what complaints, if any, have you had that it is unwholesome when used in the preparation of food? A. We have never had any complaints. On the contrary, we have a larger list of testimonials from those who have used our powder.

Q. I will now ask you with reference to the general business. First I will ask you if you have used it in your own family? A. Yes, sir; after making a thorough investigation and satisfying myself that it was a wholesome article I have used it in my family, allowing my wife and children to use it for the last eighteen years in preference to the cream of tartar powder.

Q. Are you familiar with the cream of tartar powders? A. Yes, sir. I was employed for seven years by the Price Baking Powder Company.

Q. By whom are the cream of tartar baking powders made at the present time if you know?

Objected to as irrelevant.

Objection sustained.

Defendant's counsel then and there excepted to the ruling of the Court at the time.

Q. You say that you have been using alum baking powder in your family? A. Yes, sir.

Q. What injurious effects, if any, have you observed that the food prepared with this baking powder has upon the members of your family as regards their digestion? A. We have used it for many years and I thing I am a pretty healthy specimen myself and I have a seventeen year old boy who weighs 167 pounds. I have others along the same line. A girl who weighs 92 pounds. They have all been raised on food prepared with that powder.

Q. What satisfaction has it given? A. It has given such satisfaction that I have used it in preference to any other.

Cross Examination.

By Mr. Cunningham:

Q. What brand of baking powder is it that makes such strong healthy children? A. It is the baking powder made by the Chapman & Smith Company.

Q. What particular brand of baking powder is it? A. It is the Chapman brand of baking powder, being the original twenty-five cent brand.

Q. What did you say about the Chicago Yeast powder? A. That is the same powder. For a number of years we manufactured it under that name and advertised our goods pretty extensively and established a good trade when they began immitating our name and the Courts decided that we did not have the exclusive right to the name Chicago Yeast Powder and in order to protect ourselves in the future we changed the name to the Chapman Baking Powder and it has been put up under that name ever since.

Q. Does your powder, the way you put it up bear any marks or labels stated that it contains alum? A. Yes, sir.

Q. When did you commence putting those labels on your baking powder? A. Just as fast as the old labels are used up we are putting on new labels with a statement of the ingredients of the baking powder.

Q. You say as fast as the old ones are used up? A. Yes, sir; we are putting out some at the present time with the new labels.

Q. That is the first intimation you have given the public that your baking powder contains alum? Q. When we first began putting this powder on the market we issued a circular in which we went into the whole subject commenc-

ing back with the materials our grand-mothers used for leavening purposes and also published statements from Dr. Walf of the Chicago Board of Health who had had twenty-seven baking powders analyzed and had reported favorably on ours stating that there was nothing in the alum that was in any way injurious to the health and that they could be recommended as harmless.

Q. When did you do all this? A. We issued a circular in the beginning and we have always advertised extensively and never denied the fact that our baking powder contained alum. I will state that great improvements have been made in alum baking powders in the last twenty years and the same statement will apply to the cream of tartar baking powders. They won't deny but what they have improved their powder a very great deal in the last twenty years.

Q. Well now we are getting away from the original question. My question was how does it appear on the labels that the package contains alum? A. On some of them as I before stated we have already commenced to put labels which set forth the ingredients used in making the powder. As alum is one of the ingredients that fact is set forth on the label.

Q. Are you selling these packages in the State of Missouri at present? A. Only in a very limited way.

Q. Where in Missouri are these packages to be found for sale?

Mr. Seddon: I think that question is objectionable on this ground: This is a criminal prosecution and it appears that this witness is engaged in making and selling an alum powder which comes within the prohibition of the Statutes. I don't think it is fair to get him to make a statement here on which a subsequent prosecution might be based.

Mr. Cunningham: I had not thought of it in that light when I asked the question and I will therefore withdraw it. I will state that there was no intention of doing anything of that kind.

EDWARD FLAD, a witness of lawful age being called and sworn testified on the part of the defendant as follows:

Direct Examination.

By Mr. Seddon:

Q. State your full name? A. Edward Flad.

Q. You reside here in St. Louis? A. Yes, sir.

Q. What official position, if any, do you hold here in the city? A. I am the Water Commissioner of the city of St. Louis.

Q. What has been your occupation? A. I am a graduate in civil engineering and have followed that profession ever since.

Q. Have you given the question of the wholesomeness of water and the supply of water for municipal purposes any particular study? A. I have been connected with a great many different water works and have been consulted by others in that line of business and have made the subject a special study.

Q. You say you have made a special study of the subject of the water supplies of cities? A. Yes, sir.

Q. What, if anything, do you know about the use of alum in clarifying water?

Objected to as incompetent, immaterial and irrelevant.

Mr. Cunningham: This objection is made in addition to the general objection to any testimony in this case.

Mr. Seddon: It is contended that free alum in the bread goes into the stomach and thereby causes injury. Now I want to show that one of the most important articles of consumption by people is the water itself which is used for drinking purposes and also for cooking purposes and we will show that alum is continually used in clarifying water without any harmful effects whatever. As I take it the whole examination hinges upon the question whether or not alum as put into baking powders is healthy or unhealthy and I think I have a right to show that people consume large quantities of drinking water that has been clarified with alum and in which more or less free alum remains and no harmful results have been experienced. This I think even goes beyond what would ordinarily be required of us because when used in the form of baking powder the alum in the bread takes the form of

aluminum hydrate but to cover the possible theory that there might be free alum in the bread, which we deny, we propose to show by this witness that alum is used in clarifying drink-water and that there will be more or less free alum present in the water cleared that way.

The Court: Do I understand you to say that when alum is used to clarify water at the water works that it is present in the water as free alum?

Mr. Seddon: I think it will show that there is some present and I want to go on and show how the water is clarified—the principles on which it is clarified.

Mr. Cunningham: I don't see how that could possibly throw any light on the question of determining the constitutionality or unconstitutionality of this law. Certainly it would appear to me that if it is discovered that people are selling water for human consumption that contains alum they are just as liable to a prosecution under this law as a man who sells it in the form of a baking powder. It does seem to me that if it is used as a matter of fact in clarifying water and remains there as free alum and is sent to the consumer in that condition that it would be no defense in this case to show that others are violating the law.

The Court: I think this testimony is going beyond the limit of what I ought to admit and I will sustain the objection.

Defendant's counsel then and there excepted to the ruling of the Court at the time.

Mr. Seddon: In order to develop the testimony which I had proposed to offer along this line and in order that the record may show full what I expected to prove by this witness I will state that I will be able to show by this witness that alum is used very largely in the purification of water for drinking purposes and that in the State of Missouri the water supply for over two hundred thousand people is water that has been purified with alum and that if there is any alum at all left in the drinking water and we will show that there is sometimes a small quantity left it would be taken into the

stomach in the form of free alum. We will show further that this method of purifying drinking water is a well known scientific method and that no harm whatever results from its use in that way.

Mr. Cunningham: I object to counsel making a declaration tha way of what he expects to prove. Let him ask the questions and I will make my objection and we will get it in that way. I do not think it is proper that it should go in in the way of a statement of what he expects to prove by this witness.

Mr. Seddon: Mr. Flad, will you state whether or not the use of alum in the purification of water is a well recognized method of purifying water?

Objected to as immaterial.

The Court: Now in order that the record may be complete I will ask you what is your purpose in offering this testimony?

Mr. Seddon: We propose to show by this witness that water is purified with alum for human consumption and that it is a well recognized scientific method of purifying the water.

The Court: In view of the tender made by counsel to prove that alum in its free state is an inocenous substance I will take this testimony subject to objection.

A. Yes; it is a well recognized scientific method of clarifying water.

Q. Please state to what extent it is used privately and publicly in our water supply? A. Alum is used extensively both by private individuals in their private filter and also it is used by municipal governments in connection with the public supply of water. I am not able to state to what extent it is used by private individuals although I will state as a matter of general information in my line of business that it is used quite extensively for that purpose.

Q. How is it used? Please explain the method of using it?

Same objection.

The Court: I will take this testimony subject to your objection.

A. The alum is generally introduced into the water in solution. The water to be clarified contains carbonates which break up the alum leaving an aluminum hydrate.

Q. As I understand you the alum is introduced into the water to be clarified in the form of a solution and the carbonates in the water break up the alum which forms an aluminum hydrate? A. Yes, sir. We then have present an aluminum hydrate which is insoluble in water and may be precipitated in the form of a white flocculent precipitate.

Q. You spoke about alum being used in private filters? A. Yes, sir; there is a great deal of alum—or rather a great many filters have an arrangement whereby free alum is introduced into the water for the purpose of clarifying but just to what extent or just what method they use I am unable to say. That is I mean that different individuals may operate their filters differently. I think as a general proposition though that here in St. Louis very few of them use the alum except when the water is very muddy at certain times of the year.

Mr. Seddon: As I understand it the theory on which the alum is introduced is that it forms a coagulant?

A. Yes, sir. The idea is that when the free alum is introduced in solution and the water is allowed to stand the alum, being broken up by the carbonates in the water, acts as a coagulant.

Q. What becomes of the alum? A. Well the theory is that the alum is broken up and it should be put in there in just such a quantity that will enable the carbonates in the water to decompose all of it. If there is more alum introduced than the carbonates will decompose that would leave the excess of alum in the water in the form of free alum.

Q. Then the amount of alum you introduce is regulated by the amount of carbonates present in the water? A. Yes, sir.

Q. Carbonates of lime and magnesia? A. Yes, sir

Q. Then as I understand it if the proportions are exact there will be no free alum left? A. No, sir.

Q. If they are not exact and there is an excess of alum it will be in the water in the form of free alum? A. Yes, sir.

Q. Then in order that there may be no free alum left the proportions have to be chemically correct? A. Yes, sir.

Q. And that matter has to be regulated I suppose by the quantity of lime and other carbonates in the water? A. Yes, for instance, you take the water we have here, it is a well known fact that they contain a large quantity of carbonates, relatively speaking of course, and more alum could be used for purposes of purification than in the case of other water where they have a less quantity of carbonates present.

Q. Then you ordinarily use only small quantities of alum? A. Yes, sir. That of course being regulated by the amount of the carbonates present.

Q. And if there is an excess alum it would appear in the water as free alum? A. Yes, sir.

The Court: To what extent is alum used in clarifying water in this city? A. Well I stated that it is confined to individual use in private filters in the city here, but just to what extent it is used that way I could not state it with any degree of accuracy.

Q. To what extent is it used by the municipal governments of this State? A. Well, Kansas City has at least 120,000 people and they use alum there to clarify the water, or rather they use it to settle the water. The water is allowed to stand in a large reservoir until it is settled. Then there is St. Joseph and Washington and Rich Hill and Holden and Louisiana. I should say all told those cities contain a population of 195,000 people and a fair estimate would be one hundred gallons for each inhabitant which would make about 20,000,000 gallons a day.

Mr. Seddon: About what quantity of alum does it take to clarify the water you refer to? A. Say one or two grains to a gallon of eight and one-third pounds. I havn't the exact figures before me but I can get them.

Mr. Cunningham. You do not mean that people drink all that water?

A. Well, hardly—not here in Missouri. The largest part is used for manufacturing and other purposes.

The Court: To what extent did you say alum is used in private filters?

A. I can only speak generally on the subject. I know it is used quite extensively here in St. Louis but as I said a moment ago I think most of them only use the alum when the water is very bad. I think ordinarily they depend upon the sand in the filter.

Mr. Cunningham: Those are what you call mechanical filters? A. Yes, sir.

Q. And you say that they do not always use alum? A. No, sir; not always. Only when the water is very bad.

Q. You say in proper proportions the carbonates in the water will decompose the alum and that in no event would you use more than one or two grains originally? A. No, sir; not more.

Q. It is not the idea that free alum should be left in the water? A. No, sir.

Q. So that you use one or two grains of alum to eight and one-third pounds of water and it is the idea that the alum should be entirely decomposed but if it is not entirely decomposed the amount left would be infinitely small? A. Yes, sir.

Q. And of the vast quantities of water consumed daily but a small part is used for drinking purposes? A. Yes, sir.

At this stage of the examination an adjournment was taken to January 13, 1900, at 10 o'clock.

St. Louis, January 13, 1900.

Court met pursuant to adjournment when further proceedings were had as follows:

PRESENT:

Mr. Cunningham for plaintiff.
Mr. Seddon and Mr. Stoner for defendant.

Mr. Seddon: I will now offer in evidence the depositions of the witnesses taken in New York, being the depositions of Dr. E. E. Smith and others, which relate to certain physiological experiments we have had made.

Mr. Cunningham: I make the same objection to the introduction of these depositions that I made to the introduction of testimony at the beginning of the case.

The Court: I will take it subject to objection.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

The Court: After the reading of these depositions, owing to the fact that I have a jury on hand next week in addition to the ordinary business of the Court I shall be obliged to lay this case over until the eighth of February, when I will give you the eighth, ninth and tenth.

The defendant then read in evidence subject to the said ruling of the Court the depositions of Ernest Ellsworth Smith, Austin Flint, Robert Liston Irish, Walter Howard Ross, Conrad Bart, James McGrath and Henry Seibert as follows:

Depositions of witnesses, produced, sworn and examined on the second, third and fourth days of January in the year of our Lord, 1900, between the hours of eight o'clock in the forenoon and six o'clock of the afternoon of those days at the Townsend Building, Broadway and 25th street, in the city, county and State of New York, before me Howard McWilliams, a Notary Public acting in and for the county of New York, in a certain cause now pending in the St. Louis Court of Criminal Correction, in the city of St. Louis, in the State of Missouri, between the State of Missouri, plaintiff and Whitney Layton, defendant, on the part of the defendant, Ernest Ellsworth Smith, Austin Flint, Robert Liston Irish, Walter Howard Ross, Conrad Bart, James McGrath and Henry Seibert, of lawful age, being produced, sworn and examined, on the part of the defendant deposeth and saith:

ERNEST ELLSWORTH SMITH, sworn on behalf of the defendant testified as follows:

Direct Examination.

By Mr. Sedon:

Q. Please give your full name? A. Ernest Ellsworth Smith.

Q. Where do you live? A. Yonkers, New York.

Q. What is your occupation at the present time? A. Chemist and physician.

Q. What kind of a chemist? A. Physiological chemist.

Q. Practising where? A. In New York City.

Q. Is your laboratory in New York City? A. Yes, it is.

Q. Are you a graduate of any school, and if so, what school and what branch? A. I am a graduate of the Scientic School of Yale University the department of Biology.

Q. Are you a graduate, or did you study in the medical school of that institution? A. I have not. I have studied and graduated from the graduate department of that institution. I am also a graduate of the Bellevue Hospital Medical College.

Q. Now, what physiological work have you been connected with or engaged in, and what studies have you pursued in that line? A. I pursued as an undergraduate student in Yale University, the regularly prescribed course in physiological chemistry under Prof. Chittenden, in the department of Biology, and as a graduate student I pursued graduate studies in the department of Physiological Chemistry.

Q. Did you during that time, act as assistant to anybody in this department? A. I was assistant in Physiological Chemistry to Prof. Chittenden.

Q. Of what institution? A. Of Yale University.

Q. Now, what are your degrees, if any, Doctor? A. As a graduate of the scientific department, I received the degree of Bachelor of Philosophy. As a graduate of the graduate department of the university, I received the degree of Doctor of Philosophy. Upon graduating in medicine I received the degree of Doctor of Medicine.

Q. Regular M. D.? A. Yes, sir.

Q. From Yale? A. The degree of Doctor of Medicine was from Bellevue Hospital Medical College of the City of New York.

Q. Do they have a well established college? A. Yes,

Q. What work have you done in the chemical physiological line since you left Yale? A. I was engaged for a period of four years in the laboratory, private laboratory, in a series of investigations, studying the subject of nutrition, and

did work of a varied and extensive character covering that field.

Q. Anything else? A. Since that time I have been engaged in the examination of morbid cases, diseased cases, for the purpose of diagnosis.

Q. In what class of diseased cases? A. Diseased cases in which it is thought that information of diagnostic value can be obtained by chemical, bacteriological, or microscopical study.

Q. Doctor, have you ever undertaken any experiments with the design of ascertaining the wholesomeness of bread which has been cooked or prepared with alum baking powder.

Mr. Cunningham: Objection by the State to this question as incompetent and immaterial.

A. I have.

Q. With what baking powders did you make these experiments and how did you receive them?

Mr. Cunningham: The State objects to this question and all questions as to the conduct or results of experiments by the witness on the subject stated, as incompetent and immaterial to the issues in this case.

The attorneys in this case direct that this minute shall be entered on the record. It is, therefore, by counsel understood and agreed that the State shall not be prejudiced by failure to state objections now to the questions put to the witnesses, but that all such right of objection is reserved and shall be exercised by the State at the trial as fully as if made here, except to the form of the question.

A. The food used in these experiments was prepared with baking powder received through the medium of the Express Company, the Pacific Express Company. The package was marked as the "Pacific Express Company, St. Louis, Mo.," and the powder was labeled, "Layton's Quick Brand Baking Powder."

Q. How many cans did you receive? A. Twenty-four.

Q. At what time? A. The first week in November.

Q. Will you state the date? A. I can not state the exact date.

Q. Can you state it from any date at your laboratory? A. I am not sure of that. I believe I can state it after looking up the Express Company's records probably.

Q. You will ascertain that, will you? A. I will.

Q. Did the can have on it the words, "Layton's Health Food," or something of that kind? It had on it across the label the words, "Health Food."

Q. You have not one of those cans with you at this examination, have you? A. I have not.

Q. Will you produce one after the recess so that it can be more precisely identified? A. I will.

Q. All these cans were marked with private marks? A. Each can bore the statement in ink, "October 27, 1899. W. Layton."

Q. Now, did you open any of these cans? A. I did.

Q. What did they contain? Those that you opened, what did they contain? A. They contained a white powder.

Q. Have you made sufficient analysis to ascertain what the component parts of that powder are? A. I examined the powder and found it to contain a carbonate of soda and an alum.

Q. Therefore, you were satisfied that it was that kind of baking powder known as alum baking powder? A. I was.

Q. Now, will you please describe fully what you did in carrying out this chemical physiological experiment that you said you made with this powder? A. I prepared food from the powder.

Q. Did you consult with anybody else as to the best plan of ascertaining accurate scientific results? A. These investigations which I am about to relate were undertaken after consultation with Prof. Austin Flint and Prof. Peter T. Austen.

Q. Who is Prof. Austin Flint and who is Prof. Peter T. Austen? A. Prof. Austin Flint is an eminent physiologist occupying the chair of physiology in the department of medicine in Cornell University. Prof. Austen is an eminent chemist who has been at times connected with various institutions and is now the head of the Austen Chemical Research Company.

Q. Doctor, then these experiments were really joint experiments participated in by these three persons that you have spoken of, yourself included? A. Yes, sir.

Q. After consultation with each other, did you find that any similar researches and reliable results had been made in this direction? A. We found that, in the line of inquiry on which we had decided to undertake the investigation, no similar work had been done.

Q. Did you find this was a chemical-physiological process, and whether it could be found by chemical knowledge? A. The problem was a problem of fact; the study of the problem require both chemical and physiological investigations.

Q. Did you find it was a problem that could be found by physiological experiments? A. It could not be found, except by physiological experiments.

Q. What difficulty did you find in the way of solving it? Did you consider that you could solve it in any other manner than by physiological experiments on human beings? A. I considered that information obtained by any other means would be inadequate to give the conclusions that we wished to reach.

Q. Please state what you did to carry out these physiological experiments that you said were carried out? A. We first prepared food by the use of the Layton's quick brand baking powder, which had been received and also prepared a food to be used in control experiments made by a different process, of different substances, as regards the substance to raise the bread, but similar in other respects.

Q. Now, will you describe exactly the detail, how that bread, both kinds of bread, was prepared, what proportion and by whom and under whose supervision? A. The food consisted of bread; it was made by me and co-operating with me was a competent cook. The cook's co-operation consisted in merely stating the usual methods of preparing such food adopted by cooks, and in some instances actually stirring in the ingredients. The bread made by formula 1 —

Q. Who supervised and watched the processes of baking, and was that done in all its details by anybody? If so, by whom? A. That was all looked after by myself. I weighed out the ingredients and attended to all the details of the —

Q. You saw the material mixed? A. I saw the ma terial mixed.

Q. Doctor, please state in detail and circumstantially what you did in all of these experiments? A. We first prepared bread by formula 1, known as Layton bread, in which we used for each loaf 585 grammes of flour of a high grade, 8 grammes of salt, common table salt, 17 1-4 grammes of the Layton powder, and 500 grammes of water. The dry ingredients in this formula were mixed by sieving three times. This was done in every instance by myself. The water was then added and the mixture stirred, transferred to pans, placed in an oven and baked. The oven was so constructed that the temperature was noted and the temperature was kept constant.

Q. Can you state what was the baking temperature? A. The temperature was 185 degrees centigrade.

Q. What is that in fahrenheit? A. 365 degrees fahrenheit. Bread made by formula No. 2 was made of the following ingredients: Flour 585 grammes, salt 8 grammes, common table salt, sodium bicarbonate 3 1-2 grammes, hydro chloric acid solution 11 cubic centimeters, water 489 grammes. Let me explain that the sodium bicarbonate used was Squibb's sodium bicarbonate, and the amount used was such amount as would contain the same amount of carbonic acid when liberated as a gas, as was found to be present in the 17 1-4 grammes of Layton powder used for the making of the Layton bread.

Q. What is Squibb's sodium bicarbonate—is it a recognized standard preparation? A. It is recognized as the best bicarbonate obtainable on the market, as far as I know. It is a high grade bicarbonate at least. The acid solution used in this formula was a solution of hydrochloric acid containing 15 1-2 per cent, H. Cl. This bread was made by sifting the dry ingredients three times and the water, to which the hydrochloric acid solution had been added was then stirred in with the dry ingredients, the whole transferred to pans and baked at a temperature the same as the temperature at which the Layton bread was baked—in fact throughout the experiments I followed the custom of baking two or four loaves of bread at a time, half of the number of which would be Layton bread and half of which control bread.

Q. Now you speak of water there—do you mean chemically pure water? A. No, I used a pure spring water. The water used was the same throughout all of the preparations.

The bread baked was marked for identification "Loaf 1," "Loaf 2," etc. up to "Loaf 14." Loaves figures 1, 3, 4, 5, 6, 11 and 12 were made after formula 1; and loaves 2, 7, 8, 9, 10, 13 and 14 were made after formula 2. The bread made after formula 1 is known as Layton bread, and spoken of as Layton bread; and the bread made after formula 2 is known and spoken of as control bread.

Q. Did you use any precaution that you could devise in having this bread to conform to the production of the bread you desired? A. I did.

Q. Why did you prepare this control bread, and what is this bread as usually prepared with reference to purity. A. I prepared this control bread in this particular way because the products resulting from the acid and alkaline ingredients, added to the bread for the purpose of liberating carbonic gas, would yield, as a result of such reaction only common salt which is recognized and known to be a normal ingredient of food and perfectly harmless.

Q. That is you mean table salt or chloride of sodium? A. Table salt or chloride of sodium, yes, sir.

Q. Now in preparing this powder that you used in manufacturing control bread—in preparing all baking powders—you would use an acid and alkali, would you not? A. You use an alkali and a substance which is acid, or fulfills the requirements of an acid in liberating the gas from the alkali bicarbonate.

Q. What is the object in liberating the gas? A. The object in liberating the gas is to disseminate gaseous particles throughout the doughy mass of the bread, to make it light.

Q. Aerated? A. Aerated or light.

Q. To make it raise? A. To raise the bread. That is process of raising the bread.

Q. Bread cooked without any agent to leaven or raise it would be perfectly flat and indigestible, would it not?

Mr. Cunningham: I must object to the form of the question.

Mr. Seddon: Q. State what would be the effect of cooking the bread without some such agent or assistance? A. The bread would be what we know as heavy. It would be a mass that would not be pleasant to eat and that would not be appropriate to digest.

Q. Is this control bread, or bread similarly prepared, used in experiments of this kind? A. Not so far as I know.

Q. Did you ever hear of Liebig's method or that of other authorities? A. This bread was prepared by a formula or method which is known as Liebig's method of raising bread.

Q. Why is it called Liebig's method? A. Because the method was first devised and advocated by Von Liebig the eminent German chemist.

Q. Then this control bread that you use was adopted because you considered it a normal standard of pure wholesome food did you? A. Yes.

Q. And why did you consider it such—please explain? A. Because it contained nothing that could be considered in any way foreign to a food substance.

Q. What did the bread contain after it was cooked and prepared? A. The reaction giving rise to the gas for raising the bread yielded common table salt, as the end product besides the gas.

Q. Therefore it contained nothing besides the food products of the flour and water, and chloride of sodium, common salt? A. Contained nothing but the food products.

Q. Well now go on and state what experiments you made? A. The first experiment was undertaken to determine the digestible nitrogenous matter and albumenoid nitrogen in the Layton bread and in the control bread. The method employed was a method known as Stutzer's method as modified by Sjollema. The material examined consisted of the crumb of the bread; the crumb of loaves 1 and 2 being taken.

Q. What do you mean by the crumb? A. The inside of the loaf--not the crust.

Q. Why did you take the inside of the loaf? A. Because it is the part that will yield material of constant composition and would enable me to make a more exact study. This was dried by being left for a period of twenty-seven hours at a temperature of 38 to 40 degrees, centigrade and then broken up into small fragments and spread out in a thin layer. The dry bread was then broken up into small particles in a mortar and these particles separated into three portions. The first portion consisted of the particles that did not pass through a 10-mesh seive. The second portion

consisted of particles that did pass through a 10-mesh sieve, but which did not pass through a 20-mesh sieve. The third sample consisted of particles which passed through a 20-mesh sieve. Only the second portion spoken of, that which passed through a 10-mesh sieve and which did not pass through a 20-mesh seive, was used in the experiments. The samples thus obtained were therefore composed of crumbs of a pretty uniform size. The method of carrying out the experiment consisted of mixing together in a flask two grammes of the sample of bread, 380 cubic centimeters of distilled water, 50 cubic centimenters of a pepsin solution containing 2 grammes of Fairchild's pepsin in every 100 cubic centimeters of solution; the amount of pepsin used in the experiment corresponding, therefore, to one gramme, and hydrocloric acid solution of specific gravity 1.048, 16 cubic centimeters of the solution being added at the outset of the experiment. The above samples were placed in 500 cubic centimeter flasks, and differed only as regards the particular sample of bread added, and there was also a blank experiment in which no bread was added. The flasks were placed in an incubator and left at 38 to 40 degrees centigrade for 48 hours. At the end of sixteen hours, twenty-four hours, and forty hours, eleven cubic centimeters of this same hydrochloric acid solution was added to each flask. At frequent intervals throughout the forty eight hours the contents of the flask were agitated uniformly. At the end of forty-eight hours the contents of the flask were made up to 500 cubic centimeters, the flask being graduated for that purpose. The contents were then filtered and analysis made of the amount of nitrogenous matter in solution and remaining undigested.

Mr. Cunningham: Q. You mean separately? A. Of both the filtrate and the residue on the filter. By this procedure it was ascertained that in the case of the Layton bread 99.2 per cent of the nitrogenous matter present had passed into solution and that .8 per cent remained undissolved or undigested. In the case of the control bread it was ascertained that 99 per cent of the nitrogenous matter had passed in solution and that one per cent remained undissolved or undigested. That completed the first experiment.

Mr. Seddon: Q. Now you state that you used Fairchild's pepsin solution? A. I used a pepsin solution con-

taining 2 grammes of Fairchild's pepsin i neach 100 cubic centimeters of liquid, using fifty cubic centimeters of that solution for each flask, corresponding to one gramme of pepsin.

Q. Why did you use Fairchild's solution? Is that considered a standard preparation in medicine? A Fairchild's pepsin is considered a reliable and standard preparation of pepsin in medicine?

Q. What did you consider as a legitimate scientific result to be inferred from this experiment? A. I concluded from this experiment that the practically complete digestion of the nitrogenous matter in Layton bread when subjected to pepsin-hydrochloric acid action was possible and did occur.

Q. And that the two breads were practically the same? A. The digestibility of the two breads is practically identical.

Q. Did you consider it possible to derive definite results of comparison with the action of the stomach by a test conducted on the line of the beaker experiments? A. I did not.

Q. The stomach is supposed to contain as one element of its gastric juice hydrochloric acid is it not? A. It is.

Q. And also pepsin? A. Yes, sir.

Q. Well then why can not you reproduce the digestive processes in beaker experiment so as to ascertain definite scientific results of comparison as to what goes on in the stomach? A. Because the processes in the stomach consists of more than the purely chemical action of the gastric juice, or of pepsin-hydrochloric acid, which are the active constituents of the gastric juice.

Q. In what respect? A. In the respect that its production involves the processes of the liberation of the gastric juice, or the process of secretion, and it involves the process of absorption to some extent of the products of digestion, and it involves the element of motor activity or movement of the stomach; and the passage in that way of the material into the lower part the alimentary canal.

Q. Does it involve also the action of the secretions from the mouth and saliva? A. The influence of saliva is an important element in the digestive processes in the stomach.

Q. Then this beaker experiment was made by you to determine as nearly approximately as could be done scientifically, the digestive processes that were going on in the

stomach by the use of these breads? A. I can not say that I hoped to obtain all that information from this experiment. I performed this experiment for the purpose of finding out whether the use of this alum baking powder would prevent, under the conditions of the experiment, the complete digestion of the bread, and I found it did not?

Q. Then you found that, so far as the hydrochloric acid and the pepsin solution formed a part of the gastric juice of the stomach, that it was acted upon in a similar way by these two foods, did you not? A. I did; yes, sir.

Q. And that is the value of your experiment so far as it goes in that direction? A. Yes, sir.

Q. Now will you state whether you made any other experiments along this line of inquiry? If so, what? A. I performed an experiment, which I will call experiment No. 2. It was undertaken to determine the influence of food raised with the Layton baking powder on the processes of secretion of gastric juice. The subjects of these experiments were two, and I will speak of them as "I" and "R."

Q. I prefer that you should give the names of the subjects? A. The name of the subject "I" was Dr. Irish The name of the subject "R" was Dr. William H. Ross. These subjects were instructed to present themselves at the laboratory at nine o'clock on the morning of December 12, 1899, and were further instructed to eat no food on that day before that time.

Q. Please state whether or not these two gentlemen were in good health? A. These gentlemen who were subjects for this experiment were selected because it was believed that they were in perfect health. These same subjects presented themselves at the laboratory on the morning of December 16, having received exactly the same directions as on the previous occasion, and they were on this occasion fed a meal consisting of 60 grammes of bread and 350 cubic centimeters of water. The bread on the first occasion, on December 12th, consisted of the crumb of loaves 11 and 12, being the Layton bread. On the 16th the bread composing this diet was the control bread, being loaves 13 and 14. At the end of exactly one hour a stomach tube was introduced into the stomach in each case and so much of the stomach contents were withdrawn as could be by the use of the tube. In order to determine what the influence of the Layton bread

had been upon the processes of secretion, the liquid portion of this stomach contents was then examined. Take first the subject, Dr. Irish—it was found that the total acid of the stomach contents on the 12th, the day on which Layton food had been fed, was .251 per cent, expressed as hydrochloric acid. It was determined that the amount of combined hydrochloric acid present was .143 per cent; that the amount of free hydrochloric acid present was .072 per cent. A test for pepsin to indicate the presence and activity of the pepsin present, and indeed to indicate the activity of the whole digestive fluid obtained from the stomach, was then carried out as follows: 5 cubic centimeters of the liquid portion of the stomach contents was placed in a tube, and to this two-tenths of a gramme of moist albumen prepared under constant conditions for the various experiments was added, and the whole placed at a temperature of 38 to 40 degrees Centigrade, in the incubator and occasionally agitated. It was observed in the case of Irish, whom we are mentioning, that the albumen had passed in solution at the end of an hour. The study of the liquid portion of the stomach contents after eating the control bread on December 16th, yielded the following results: Total acid expressed as hydrochloric acid, .233 per cent; combined hydrochloric acid, .136 per cent; free hydrochloric acid, .086 per cent. In the pepsin test, five cubic centimeters dissolved two-tenths of a gramme of moist albumen, when placed at 38 or 40 degrees Centigrade, had dissolved the albumen at the end of one and one-half hours. The observations upon the subject, Dr. Ross, under these conditions which have been outlined in the case of Dr. Irish.

Q. You pursued the same identical processes? A. The process is identical in the two cases. The results in the case of Dr. Ross are as follows: This is December 12th, when the Layton bread was used. Total acid, .220 per cent expressed as hydrochloric acid; combined hydrochloric acid, .145 per cent; free hydrochloric acid, .070 per cent. In the pepsin test solution was complete in one and one-half hours. In the Ross case, December 16, using control bread—total acid, .221 per cent; expressed as hydrochloric acid; combined hydrochloric acid, .131 per cent; free hydrochloric acid, .069 per cent. Pepsin test, solution completed in one and one-half hours.

Q. Have you given the figures on both subjects now,

with reference to both Layton bread and control bread, and all the experiments? A. I have.

Q. December 12th to December 16th? A. I have given the experiments covering that period.

Q. They are practically the same results? A. The results varied only within such a degree as is physiological.

Q. Due to the idiosyncracies of the individual, or may be due? A. Due to the physiological conditions that are subject to slight variations.

Q. At different times? A. At different times.

Q. Doctor you have explained this in scientific terms which are very intelligible to scientific people, but now will you please state to us clearly what is the value of these experiments, if they had any value, with reference to determining the wholesomeness or the contrary of bread baked with an alum powder such as you used in the experiments? A. The experiments were undertaken to ascertain whether the food prepared with a Layton baking powder, or the alum baking powder, interfered in any way with the processes of secretion in the stomach.

Q. Secretion of what? A. The secretion of gastric juice.

Q. That is a necessary concommitant of digestion? A. That is a necessary concommitant of stomach digestion.

Q. And what is your conclusion with reference to the use of the alum bread, as to these necessary processes of digestion—the secretion of the gastric juices? A. My conclusion was that the alum bread did not in any way interfere with the processes of secretion of gastric juice in the stomach.

Q. If this bread had contained an astringent, would it have influenced the secretions which you speak of? A. It certainly would.

Q. What, then, is your conclusion with reference to the normal influence of Layton bread as used in these experiments and as a food, with reference to the digestion? A. The experiment was not undertaken to determine anything directly regarding the digestion of Layton food—it was undertaken to determine the influence of the food on the processes of secretion, one of the important steps in the process of stomach digestion, and it was found that it had no harmful influence.

Q. Did you conduct any further experiments, and if

so, what, and how did you conduct them. Give them in detail fully? A. I conducted an experiment which I will describe as experiment 3. It was conducted to ascertain the coefficient of availability, meaning digestibility of a diet containing food raised with Layton baking powder. The amount of bread present in the diet was about two-thirds of the total diet, being Layton bread in one period and in the other period control bread the subject of this experiment was myself.

Q. State the condition of your health at that time? A. The condition of my health was good at that time. The experiment consists of two periods, period No. 1 and period No. 2. During period No. 1 the bread in the diet was the bread raised with an alum powder, the Layton bread; during period No. 2, the bread used in the diet was bread raised after the method of Liebig—the control bread. Period No. 1 was a period of three days, November 13th, 14th and 15th, of the past year. The material eaten I will describe in detail—

Q. First describe why you employed three days as the period for the test? A. I used three days as the period for the test because it is recognized by scientific authorities that a period of that length of time is desirable in order to get a correct and accurate result; and it is also recognized that it is sufficient to yield such a result.

Q. I will ask you with reference to these other experiments made on Dr. Irish and Dr. Ross why you separated the experiments three days? A. I did that so as to eliminate the possible influence of the experiments one upon the other. With individuals who are unaccustomed to taking a stomach tube there may be some reaction following the administration of the tube, particularly so in this case because the men practically went without breakfast, having no meal to eat until the midday meal.

Q. In your opinion the lapse of three days was a sufficient precaution against that? A. Was an adequate time to eliminate the influence of the previous experiment. The material used in period 1 of experiment 3 consisted of the crumb of loaves 3, 4, 5 and 6, Layton bread. This was chopped, weighed off in 150 gramme portions at the beginning of the experiment, and each portion was wrapped in wax paper and white paper and put away for use in the diet; the composition of this bread was ascertained—

Q. What was the object of putting it away? A. So as to have it at hand; so that it could be reached.

Q. I mean putting it away in wax paper? A. It was put in wax paper so that it would not become unnecessarily dry—so as to keep it about the same condition throughout the experiment.

Q. That did keep it in the same condition? A. Practically the same condition. Analysis was made of this bread and it was found to have the following composition:

Moisture	52.46 per cent
Solids	47.54 per cent
Protein	6.50 per cent
Fats	6.22 per cent
Ash	1.42 per cent
Carbohydrates	39.40 per cent

The material eaten consisted further of meat which was prepared before the experiment in the following way: Round beefsteak was first stripped of all visible fat and the lean portion then chopped fine, cooked in a frying pan, salted, some of the juices pressed out and the residue was distributed in jars in fifty gramme portions, each jar containing fifty grammes. The jars were then sterilized. The composition of this meat on analysis, so far as it was analyzed, showed it to contain 50.54 per cent of moisture; 49.46 per cent of solids; 41.56 per cent of protein, and 5.43 per cent of fat. Further material for food in the first period was milk which was sampled each day and the composite sample analyzed. it was found to contain the following: Water, 87.66 per cent; solids, 12.34 per cent; protein, 3.10 per cent; sugar, 4.78 per cent; fat, 3.70 per cent. The butter used during this period was from a five pound pail of butter, which was sampled, an analysis of which gave the following composition: Water, 10.45 per cent; solids, 89.55 per cent; fat, 88.04 per cent; protein, 0.49 per cent.

Q. Were these foods, as you described them, which you used in this diet normal, pure and wholesome foods according to the recognized standards of foods? A. They were. The diet was arranged as follows—for breakfast on the morning of November 13, 150 grammes of bread, 50 grammes of meat, 30 grammes of butter and water; lunch, 300 grammes bread, 500 grammes of milk; dinner, 150

grammes of bread, 50 grammes of meat and 30 grammes of butter. On November 14th, diet for breakfast lunch and dinner were identical to those on the 13th. On November 15th the diet was as follows: Breakfast, 150 grammes of bread, 50 grammes of meat, 15 grammes of butter. Lunch, 300 grammes of bread, 500 grammes of milk. Dinner, 150 grammes of bread, 50 grammes of meat and 15 grammes of butter, making a total amount of food consumed during this period of three days, 1,800 grammes of bread, 300 grammes of meat, 1,500 grammes of milk and 150 grammes of butter. The nutrients contained in this diet were, therefore, as follows, calculated from the analysis which has been already given, the quantities being expressed in grammes:

	Solids.	Protein.	Fat.	Carbohydrates.
Bread	855.7	117.0	3.96	709.2
Meat	148.38	124.68	16.29	
Milk	185.1	46.5	55.5	71.7
Butter	134.325	0.735	132.06	
Total	1323.505	288.915	207.81	780.9

From this it will be seen that the solid nutrients of the bread were 64.6 per cent of the total solids. Such is the diet consumed in the first period.

Q. I ask you whether this diet was a full and nutritious diet? A. The diet was a full and nutritious diet. During this period of three days the excreta were collected and examined.

Q. Please state what precautions, if any, you took to see if you got all the excreta from this diet? A. On the evening of November 12, at the close of the customary meal six grains of lamp black were taken. Before the breakfast of November 16th, being about half an hour previous, twelve grains of lamp-black were taken. The object of the lamp-black was to mark the point in the excretion of fecal matter by which the residue there from this food was separated from the residue of the diet eaten during this period and the purpose of the lamp-black at the end was to mark the end of the residue at this period.

Q. How does it mark it? A. It marks the end by giving a black appearance to the residue of food of the meal taken with the lamp-black.

Q. Is that an approved scientific method of determining the fact? A. That is an approved scientific method of determining that fact. Movements of the bowels occurred daily during the period, and on the 14th the last portion of the dark stools in which the first lamp-black appeared were separated from fecal matter that came at the end of emptying the bowels, and only the second portion passed, which was light green as compared with the dark blackish portion of the first portion was reserved. On the 15th all of the movement was reserved and on the 16th all of the movement was reserved. At the end of the 16th a considerable amount of lamp-black appeared. This was all included with the specimen of the feces collected at this time, as representing the excreta obtained during this period. This fecal matter was moistened with hydrochloric acid and dried to a condition which we call air dry material, and was found to be 59.1 grammes in weight, the residue. The analysis showed in this material the following constituents: Moisture, 8.62 per cent; solids, 91.38 per cent; protein, 44.62 per cent; fat, 18.91 per cent; carbohydrate material, 25.83 per cent in the residue. It is thus seen that the total constituent of the fecal matter was 54.006; protein, 26.37; fat, 11.176; carbohydrate, 15.265. These are all in grammes. Comparing this with the amount of nutrients eaten it is seen that the amount of material appearing in the feces was as follows, this being the percentage of the food eaten: Solids, 4.08; protein, 9.1; fat, 5.37; carbohydrate, 1.95, leaving the percentage of the diet appropriated by the system, during the period of three days—solids, 95.9; protein, 90.9; fat, 94.63; carbohydrate, 98.05. During this period the urine was collected. The bladder was emptied at 7:30 o'clock a. m., November 13, and all material passed from the bladder up to and including November 16, at 7:20 o'clock a. m. was retained in the specimen. The volume of the urine was 3,500 cubic centimeters; the specific gravity was 1.023; the amount of nitrogen was 1.348 grammes in each 100 cubic centimeters, being a total for the entire amount of 47.18 grammes. The indican reaction of the urine showed the presence of a moderate amount. Sulphates in combination with organic matter known as ethereal or combined sulphates were determined, and the amount found in 100 cubic centimeters was .0159 grammes, and the total amount was 0.556 grammes. That completed the analytical data on period 1.

Recess until 2 p. m.

After Recess.

ERNEST ELLSWORTH SMITH resumed the stand and direct examination continued.

By Mr. Seddon:

Q. Dr. Smith, you were proceeding to detail to us the experiments that you described as experiment 3, and you had not finished your description when we adjourned for recess. Will you please continue? A. I will proceed to describe the third experiment, period No. 2 covering three days, November 20, 21 and 22, on which the subject, myself partook of a diet similar in character to the diet used in period 1 and differing only in substituting for the bread of that diet bread which we have spoken of as control bread.

Q. You speak of "similar"—was it not part of the same preparation of food? A. It was except as regards the milk. The material eaten during this period consisted of bread crumbs of loaves 7, 8, 9 and 10, chopped and weighed off in 150 gramme portions, before the beginning of the experiment each portion wrapped in wax paper and kept exactly as had been done with the Layton bread. The composition of this bread as determined by analysis was as follows: Moisture, 50.26 per cent; solids, 49.74 per cent; protein, 6.81 per cent; fat, 0.24 per cent; carbohydrate, 41.30 per cent. The meat was the sterilized meat that had been analyzed and prepared in period 1. The milk was from the same source as milk in period 1 and the milk on various days was sampled as in period 1, and the composite sample analyzed and the following composition was found: Water, 86.37 per cent; solids, 13.63 per cent; protein, 3.13 per cent; sugar, 4.76 per cent; fat, 5.03 per cent.

Q. How does that compare from a physiological standpoint with the milk used before? A. The milk was practically the same with the exception of the amount of fat. The amount of fat was more in this. No, not enough to make any material difference; from the nature of the experiment it will make little difference; it is credited for. In the experiment the diet eaten, starting on November 20, consised of—breakfast, 150 grammes of bread; meat, 50

grammes; butter, 30 grammes. For lunch, bread, 300 grammes and milk, 500 grammes. Dinner, bread, 150 grammes; meat, 50 grammes; butter, 30 grammes. The diet on the 21st was the same amount of food as that on the 20th. On the 22d the diet consisted of 150 grammes of bread, 50 grammes of meat, 15 grammes of butter, for breakfast. Lunch, 300 grammes of bread and 500 grammes of milk. Dinner, 150 grammes of bread, 50 grammes of meat and 15 grammes of butter, making the total amount of food eaten during the three days—1,800 grammes of bread, 300 grammes of meat, 1,500 grammes of milk, and 150 grammes of butter. The total nutrients in grammes contained in this diet were as follows:

	Solids.	Protein.	Fat.	Carbohydrates.
Bread	895.32	122.58	4.32	743.04
Meat	148.38	124.68	16.29	
Milk	204.45	46.95	75.45	71.4
Butter	134.325	0.735	132.06	
Total	1382.475	294.945	228.12	814.8

It will be seen that the solids of the bread in this period constituted 64.7 of the total solids of the diet. That is all regarding the diet during that period.

Q. State whether you consider the bread to be a wholesome bread and whether that was a full and nutritious diet for you? A. It was a full and nutritious diet. As to the examination of the excreta—the feces were separated in exactly the same way as recorded in period 1, by the administration at the close of the meal on November 19 of six grains of lamp-black, and at the end of the period, that is on the morning of November 23d before eating, the lamp-black was administered to the amount of 12 grains. The feces appearing between these two black colored masses in the stools were separated on November 21, 22 and 23 and samples were then analyzed. This was treated in the way in which the specimen was treated in the first period, a corresponding specimen, and yielded 68.3 grammes of air dry material. The composition of the material was as follows—moisture, 16.92 per cent; solids, 83.08 per cent; protein, 43.63 per cent; fat, 18.69 per cent; residue, 19.40 per cent. The total amounts of the various constituents are then as follows—solids, 56.744

grammes; protein, 29.799 grammes; fat, 12.77 grammes; carbohydrate, 13.25 grammes. In comparing the food and the feces in this period, then, it is seen that the percentage of material appearing in the feces as compared with the food was—solids, 4.1; protein, 10.1; fat, 5.6; carbohydrate, 1.6; the percentage of the diet available therefore being—solids, 95.9; protein, 89.9; fat, 94.4; carbohydrates, 98.4.

By Mr. Cunningham:

Q. You say available—you mean which had disappeared? A. Yes, sir. The urine was collected during that period from November 20th at 7:30 o'clock a. m., when the bladder was empty to and including the emptying of the bladder on November 23d at 7:30 o'clock a. m. The volume of the urine thus collected was 3,250 cubic centimeters; the specific gravity was 1024.5; the nitrogen was found by analysis to be 1.436 grammes in 100 cubic centimeters, the total specimen containing, therefore, 46.67 grammes of nitrogen. The indican was present in a moderate amount. The combined sulphate expressed as sulphuric acid was .01624 grammes in 100 cubic centimeters; the total amount during the period contained in the specimen being .528 grammes. Comparing then the amount of diet available or made use of by the system, during period 1, and period 2, we find that the amounts are practically identical. In comparing the urine during these periods we find that there has been nothing present in the urine to indicate an abnormal process. In connection with the urinary findings, to take them up more in particular, I may explain that normally in the lower part of the digestive tract bacteria are present and grow and food residue which reaches that part of the intestinal tract which has not previously been absorbed undergoes putrifactive processes resulting from the growth of bacteria. That is a normal process in digestion. If indigestion occurs then food material passes down into the lower part of the intestinal tract which should have been absorbed earlier—possibly that is one of the usual occurrences, and as a result we find food putrified which should not have putrified in the intestine. This indicates itself in the urine in this way—the products of intestinal putrifaction are absorbed, certain of them that are absorbed, are changed or modified slightly, and they are excreted through the kidney. One

of the products of intestinal putrifaction is indol, a gas. Indol is absorbed and transformed in the blood into indoxyl. Indoxyl is united with sulphate of potash or soda which are present in the blood as a normal constituent and is eliminated in the urine as indoxal-potassium-sulphate. There are substances besides indol that are eliminated in this way. These bodies that appear in this combination with sulphuric acid in the form known as combined or ethereal sulphates, are considerably increased in cases of indigestion or disturbances in the alimentary canal. We found in these experiments that the amount of these substances appearing in the urine is practically the same and therefore we concluded not only that the amount of material digested is the same as shown from the examination of the feces, but that the digestive process has proceeded without disturbance.

By Mr. Seddon:

Q. Why did you adopt intervals between these two periods; was your health normal, and did it continue the same during the period over which these experiments extended? A. My health was the same during these periods, and was normal. The interval between the periods was adopted in order to eliminate any possible influence of the monotony of the diet.

Q. In your opinion did you take sufficient precaution in that respect? A. I did.

Q. Now I will ask you a general question, Dr. Smith. What is your inference or conclusion as to the effect of the influence of the eating or consuming of these two breads, comparing the same, upon the digestion of the human system? A. My conclusion is that the two breads are equally digestible and have the same value to, and action upon the human system.

Q. What is your opinion as to the wholesomeness as a food of the bread that you call the control bread? A. My opinion is that it is an ideal bread or food.

Q. What is your conclusion as to the wholesomeness, as a daily diet consumed by man, of a bread properly cooked with alum baking powder properly prepared? A. That it is perfectly wholesome.

Q. Have you obtained the can of baking powder that I requested you to secure? A. I did. Here it is.

Q. This is one of the cans that you now hand me, is it not? A. That is one of the cans that I received.

Q. All the others were labeled in the same way? A. All the others were labeled in the same way; identically the same.

Q. And had the same lettering in ink, in handwriting, "October 27, '99, W. Layton?" A. They did.

Mr. Seddon: I wish to introduce this can in evidence as an exhibit.

Received in evidence and marked Exhibit A of this date.

Q. Have you sent to Prof. Edward K. Keizer of St. Louis, Missouri, any of the powder that you used in making these experiments? A. I have.

Q. How did you send it; when did you send it, and how was it marked for identification? A. I sent this powder in a sealed can through the mails, registered, on the 2d day of January, 1900.

Q. Have you the registry receipt? A. I have.

Mr. Seddon: I ask that the registry receipt be received in evidence as an exhibit.

Received in evidence and marked Exhibit B of this date.

Q. How did you mark the can for identification? A. I marked on the box "Specimen No. 2, E. E. Smith, January 2d, 1900;" I either marked it 1899 or 1900. I am not now positive which, but it is the only package I have sent to him in that way, marked as above.

Q. You sent him one of these cans? A. Yes, the can had been opened.

Q. You sealed it? A. I did not seal the can directly. I put it in a paper and sealed the package.

Q. You say it contained part of the powder that you actually used in making this bread? A. It contained part of the powder actually used by me in making this bread. I sent Mr. Keizer a memorandum enclosed at the same time.

Q. What was the amount, in teaspoonfuls, of the pow-

der that you used per quart in raising this bread? A. I used two rounded teaspoonfuls in each loaf as described. It was about a quart of flour.

Q. Why did you use that proportion? A. The directions upon the can of Layton powder state—"Use as you do the most costly brands." In making up the bread I followed a receipt which appears in a Cleveland Baking Powder book and that stated to use two teaspoonfuls.

Q. Do you know what the Cleveland Baking Powder is? A. I do not, except from general knowledge. I do not know it from my personal knowledge. The cook book, just referred to accompanies the Cleveland Baking Powder and is given away by them, and recommends the use of their powder.

Q. What was the result in cooking this bread as to leavening or raising it properly? A. The leavening was very satisfactory indeed; but the term leavening is more properly applied to yeast. It was raised.

Q. It was raised; in other words it made a proper bread in your opinion? A. It made a proper bread in my opinion.

Q. Now after this bread was cooked with Layton baking powder, as you stated, did you make any analysis for the purpose of determining whether there existed any free alum in the bread? A. I did.

Q. What was the result? A. I found no free alum.

Q. What did you conclude then with reference to the neutralization of the alum which was contained in the baking powder after it had gone through the process of baking? A. I concluded it was no longer there in a form which would pass into solution.

Q. That is free alum? A. Yes.

Cross-Examination by Mr. Cunningham.

Mr. Seddon: I do not want to consume time by repeating objections. I suppose the same stipulation will apply to making objections at the trial conceded to the State at the beginning of the taking of depositions.

Mr. Cunningham: Yes, that is understood and will apply.

Q. What is alum? A. The term alum is used dif-

ferently under different circumstances. To the chemist—

Q. What is the meaning of the term as used in common language and in common sense? A. The term as used in commercial language is that alum is a compound of sulphate of aluminium.

Q. Anything else besides sulphate of aluminium? A. Nothing else.

Q. You think then that the commercial alum is a sulphate of aluminium, pure and simple? A. Yes, sir.

Q. Well, alum of commercial use is something besides that is it not, besides sulphuric acid and alumina? A. It contains potassium sulphate or sodium sulphate—that is part of the compound.

Q. I am speaking of alum as a compound? A. I said alum is a compound of sulphate of aluminium.

Q. What other things besides sulphuric acid and alumina do the alums of commerce usually contain? A. Potassium alum contains potassium sulphate; sodium alum contains sodium sulphate, and ammonia alum contains ammonium sulphate in addition to the aluminum sulphate.

Q. Now is alum a constituent of any natural food article or product that you know of, by which I mean something produced by nature, without art or manufacture? A. No.

Q. Is it nutritious when taken as a food, by which I mean does it build any tissues that you know of, alum? A. The compound alum does not exist in any tissues, so far as I know.

Q. They are not in the ordinary food cereals, or food meats, or food fruits, that you know of? A. The compound alum, no.

Q. How is it manufactured? A. Alum is made usually from aluminium sulphate as I understand.

Q. How is aluminium sulphate obtained? A. Aluminium sulphate is obtained from cryolite, a mineral.

Q. What are the constituents now of alum? I believe you stated it but I will ask you to repeat? A. It contains aluminium, sulphur, oxygen, and either sodium potassium or ammonium.

Q. Does it contain sulphuric acid? A. It contains a sulphuric acid radical, but not as sulphuric acid; it is a sulphate.

Q. If you decompose the alum you would obtain sul-

phuric acid as one of the constituents would you not? A. It depends upon how you decompose it.

Q. You might decompose it so as to obtain that? A. You might obtain sulphuric acid by a process of decomposition, indirectly.

Q. When you take cryolite to treat it what treatment do you give it? A. I am not familiar with that.

Q. Is not most of the alum of commerce obtained by treating an earth with sulphuric acid? A. It may be obtained by treating an earth known as alum slate—

Q. Doctor, I ask you whether you don't know that, as a matter of fact, that it is the usual mode of preparation? A. I don't know. I am not a commercial chemist.

Q. Now what is the popular name, if any, for sulphuric acid? A. Oil of vitriol.

Q. What is the effect on the tissues of the body of direct application of sulphuric acid? A. It corrodes or eats the tissues.

Q. Consumes them? A. It depends upon what you mean by consumes.

Q. Does it not disintegrate the tissues? A. It destroys the tissues if in a strong solution. In dilute solution it would act differently.

Q. The solution would have to be very dilute in order not to act disastrously upon the tissues. I speak now of ordinary sulphuric acid of commerce? A. Why, it depends just upon what you mean by very dilute. It is used as a medicine, and does not corrode the tissues in medicinal doses.

Q. As sulphuric acid generally occurs in commerce—commercial sulphuric acid? A. Strong sulphuric acid would corrode and eat any organic matter.

Q. Now what are the properties of the alum of commerce; its taste, its reaction? A. It is an astringent as regards its taste; it puckers the part to which it goes; it diminishes the blood supply to that part.

Q. If a part is a secretive or secreting organ does it not arrest the secretion or activity of the organ, say of the mouth or throat? A. It does.

Q. Now, I understand your testimony to be that you received a number of packages or cans of this Layton pure food, or Layton's quick health food, or Layton's quick baking

powder, and that the experiments which you have recited were made upon the contents of some of these cans—that is true, is it not? A. I used the contents of some of these cans in making the experiments.

Q. Did you find anywhere upon the can any suggestion that it contained alum or that its contents contained alum? A. I did not.

Q. How did you ascertain the fact, as I understand you to have said, that you found this to be alum in connection with bicarbonate of soda? A. By chemical examination.

Q. Did you make a careful analysis of it? A. A quantitative analysis.

Q. Yes, sir. A. I did not.

Q. So you are not able to state of your own knowledge what proportion of the baking powder was alum, and what proportion of it was composed of other substances? A. I am not.

Q. I understand you to say, Doctor, that if the food prepared with this baking powder had been astringent at the time it was introduced into the mouth and stomach, it would have interfered with the secretion of the gastric juice of the stomach—in what way would that have occurred? A. I stated that if the food had had an astringent action and had diminished the gastric juice that would have been determined by that experiment. The secretion of gastric juice is dependent upon the blood supply, and the alum would have acted if it had been present, by diminishing the blood supply to the part and in that way interfering with the activity of the mucous lining of the stomach.

Q. What then, Doctor, would have been the result if, instead of the proper proportions of the sulphate of alumina and soda, with the bicarbonate of soda, these proportions had been different from such proportions as would result in a neutral compound, one or the other had been in excess? A. I do not know—I did not try the experiment.

Q. Suppose there was not enough of the bicarbonate of soda to take up the sulphuric acid from the sulphate of alumina, can you not tell what would happen? A. I did not make any experiments to determine that—

Q. I understand that, but I ask you if you do not know

that? A. Well, that would depend upon a variety of circumstances.

Q. I did not ask for the physiological effect; I asked for the chemical result? A. I thought you were asking the question in relation to the stomach. What would be the effect if too little bicarbonate of soda were present?

Q. Yes? A. The effect would be that all of the alum would not react with the bicarbonate of soda, if there was not enough bicarbonate of soda to react with the alum.

Q. What would be the consequent activity of the residue then, if all your bicarbonate of soda was acted upon and there still was a residue of active sulphate of aluminium? A. A residue obtained under what condition?

Q. Merely of mixing. I am speaking now of the introduction into the stomach of a mixture of alum with something else, bicarbonate of soda—now I say what would be the result if the substance that was introduced there was one that was produced by the action of the sulphate of alumina on the bicarbonate of soda, where the sulphate of alumina was in excess? A. The question is very indefinite.

Q. I mean to ask if you would not have a surplus of alum there, Doctor? A. Do you mean in mixing the bread?

Q. I mean in mixing the substance in any manner, in a glass for instance, mixing alum with bicarbonate of soda and introducing it into the stomach, I want to know what would be the upshot of the matter if there is not enough bicarbonate of soda to neutralize the alum? A. Under those conditions the alum would be unneutralized.

Q. Is alum soluble in water warmed to a temperature of 90 to 110 degrees Fahrenheit? A. I think it is.

Q. Doctor, you know it is? A. I know it is—it is.

Q. Do you know what was done in the way of mixing this compound that you tested, and the way of getting the proportions of bicarbonate of soda and alum? A. Do I know whether that is in the right proportions?

Q. I ask if you know anything about what was done in the preparation of the powder? A. I do not know anything about the manufacture of it at all.

Q. You do not know who prepared it, so far as that is concerned, of your own knowledge—whether it was prepared for sale in the market or whether it was specially prepared as the subject matter of your experiments? A. It was re-

ceived by me and that is all the knowledge I have of it.

Q. You can not say that this stuff which you experimented upon is the same product or article which is sold in the market commercially, can you? A. No.

Q. Did you undertake to analyze the bread itself which you obtained from this bread making of your own? A. I gave the analysis of it in my deposition.

Q. Did you there determine the amount of alumina or of alum, the amount of alum, say, which it contained? A. I did not.

Q. So, Doctor, your notes of analyses do not show anything about alum? A. My analyses were made to show the food value of the bread and I studied only three classes of food nutrients, protein, fats, and carbohydrates and the aluminium would not come in under any of those classes and so it had no purpose in my work.

Q. You do not know how much alum you started with? A. I do not.

Q. And you do not know how much you wound up with? A. I do not.

Q. You have made no experiments to test that? A. I know that there was no alum itself present in the product I ate. I tested that and so testified. The alum was in the product that I started with. I tested that and found it there. That is all I know regarding it.

Q. You did not test for alum at successive stages of your experiments? A. What experiments are you referring to and what stages?

Q. You have stated that you made a qualitative analysis of the powder to start with; and that is the only analysis you made in which you looked for alum? A. That is the only analysis of the powder which I made in which I looked for alum.

Q. Did you look for alum in the bread? A. I did.

Q. And did not find any? A. I did not find any.

Q. What had become of the alumina? I do not know.

Q. What had become of the sulphuric acid? A. The sulphuric acid, I assume from my knowledge of what took place in there—I know from my knowledge it was transformed into sodium sulphate.

Q. And what is the popular name for sodium sulphate; what salt? A. Glauber salt. I may add that sodium sul-

phate, which is known as Glauber's salt is a different substance than sodium sulphate as it occurs in other conditions. Glauber's salt assumes the presence of a certain amount of water in molecular association with sodium sulphate. I have not any knowledge on the point, and do not believe there is any such association in the sodium sulphate that results from this reaction.

Q. What is the effect of Glauber's salt? A. Glauber's salt taken in a large quantity is a saline purgative; a cathartic.

Q. Can you tell, Doctor, what would be the effect upon food as you have prepared it of using alum in combination with other things, a base for instance, where the proportion of the alum and the base was not exact in chemical equivalents, to produce a neutral salt—what would be the result? A. Do you mean alum or aluminium?

Q. Alum? A. Alum does not enter into any such combination to form salts at all. Alum is a salt already formed.

Q. But the salt you call alum is broken up at once in coming in contact with the carbonate of soda? A. It is.

Q. That is what I mean by the action of alum on the carbonate of soda. I ask you if you can tell what would be the result if there is twice the proportion of alum put into this mixture of alum and carbonate of soda? A. I have answered before—it would remain unacted upon by the carbonate of soda.

Q. You would have alum there all the way through would you not? A. I can not state whether you would or not? A. I can not state whether you would or not. I can not state what changes the alum would undergo in being baked in bread. I have not investigated that. Whether it would be decomposed by the bread is a subject that would have to be investigated. It may have been investigated, but if not it would have to be investigated and decided by observation.

Q. You have come to a conclusion that the alum baking powder properly prepared, when used in making a bread properly prepared and cooked, is wholesome? I understand that to be the conclusion reached? A. I reached the conclusion that the bread was wholesome—the use of the powder did not interfere with the wholesomeness of the bread.

Q. Do you know whether there is a consensus of

opinion among scientists on that proposition—whether all men who have looked into the subject agree with your conclusions? A. My opinion is that the subject has never been properly investigated before.

Q. But whether investigated properly or improperly, I ask you whether all men have come to the same conclusion about it who claim to have looked into it? A. I do not think I know of any investigations in which this question of the digestibility of the food and the wholesomeness of the food has been studied; consequently I can not come to any opinion regarding the opinions of those who may have studied the subject.

Q. I ask you do you not know that scientific men have expressed opinions on the subject of the healthfulness or unhealthfulness of alum as a food? A. I know that there have been expressions of opinion on the healthfulness or unhealthfulness of the use of alum powder.

Q. Do all the opinions expressed on the subject agree with each other? A. I think they do not.

Q. There is a diversity of opinion? A. I think there is.

Q. A decided diversity? A. Unquestionably, yes.

Q. When was your attention first called to this subject of alum in food? A. In what way do you mean, as a scientific man?

Q. In any way? A. I can not say that.

Q. As a scientific man? A. In October, 1899 I undertook those particular experiments at that time. I was, of course, familiar with the statements of the literature to some extent previous to that; but just when I first became familiar with the subject from a literary point of view, etc., I can not say.

Q. Are you a man of a family? A. I am.

Q. Do you use alum baking powders at home in your family? I mean in the ordinary preparation of food for your family? A. We have of late.

Q. Has that been your habit? A. I do not exercise any great influence over the baking powder question in our domestic life. That is a matter I leave to my wife, but it is my opinion that we have not used an alum powder.

Q. Doctor, you are a practicing physician? A. I am.

Q. Can you tell what would be the effect of introducing

into the stomach unneutralized alum, free alum, such as would arise in a case where, in making a food product an excess of the alum has been used above what is necessary to break up the bicarbonate of soda? A. I have stated that I do not know the nature of the changes the alum undergoes from contact with the food product.

Q. Can you tell then as a physician what would be the effect on the organs or alimentary canal from one end to the other? A. Of what?

Q. Alum? A. Under what conditions?

Q. Pure unneutralized alum? A. Take a solution of alum for example and introduce it?

Q. Yes. A. I think I have already testified as to the effect that would have upon the organs. It would constrict the part—have an astringent action.

Q. Is that all you can say about it? A. That is all I can say unless you give me more definite conditions to say it under.

Q. It passes into a soluble condition—soluble in water? A. How much, please?

Q. An unlimited quantity, if you please? A. A man would drown.

Q. I mean to get into his stomach. Let us put it at any amount you choose that will go into the stomach, and you say it would have an astringent effect and suspend the circulation of the blood in the organs it comes in contact with; it would arrest the function of that organ would it? A. I think it would act as an emetic to cause vomiting.

Q. Suppose not enough was taken to produce that effect, but the organ would submit to it. A. It would then interfere with the secretion of the gastric juice and if in sufficient amount, would produce constipation.

Q. Would it not be taken up and carried into the circulation to some extent? A. It might; I think it would be to some extent.

Q. What would be the effect in the different organs to which it might be carried that way into the circulation? A. I do not think it would have any special effect; it would be readily eliminated by the kidneys.

Q. Is that a matter of opinion at large, or have you made any observations or experiments that would go to prove it? A. Merely as an opinion at large.

Q. Is that the first organ, the kidneys, it would go into in the circulation? A. It would pass into the liver.

Q. What would it do there? A. It might be thrown out into the contents of the intestines.

Q. It might not? A. I do not know; I have not investigated the subject.

Q. Have you any opinion? A. I have no opinion, except in a general way, such as I have been expressing to you.

Q. As to whatever of the alum was insoluble, that would go through the alimentary canal and be thrown out in the feces? A. It would.

Q. As to what was soluble, was absorbed by the walls of the alimentary canal, that would pass some way or other into the circulation, and you would depend on some organ or other to excrete that in order to prevent a general contamination of the circulation, would you not? A. In order to prevent the accumulation of the material in the body.

Q. Now, upon what organ would you depend to excrete that matter? A. The kidney.

Q. Why, particularly the kidney? A. Because the kidney is chiefly the organ that is concerned in the elimination of inorganic solids.

Q. You call this a solid, when it is already in solution? A. Yes, sir.

Q. It is in suspension? A. It is in solution. This assumes it has not been changed in any way. Supposing, for example, it was injected directly into the circulation. As a matter of fact, it is probable that even in the process of absorption into the intestinal wall, it would come in contact with the albuminous substances and be rendered insoluble.

Q. What effect would it have on these substances? A. It would constrict the tissues and act as an astringent.

Q. You speak of where the tissue itself is corroded in some albuminous substances? A. The tissue itself is albuminous in its nature.

Q. So that it would be uncertain what might ultimately become of the alum, if it once got into the stomach as alum unneutralized—you can not tell what might be the effect, or what might be the ultimate destiny or destination of that alum. A. I think I have outlined that.

Q. You think it would go through? A. I think it

would come in contact with the walls of the stomach and there be rendered insoluble, or absorbed, and be eliminated by the kidneys.

Q. Suppose it went through the liver, as you have said might be possible, can you say that there would not be any injurious effect upon that organ by having this foreign substance pass through it? A. I should not expect there would be any injurious effect. I have no knowledge that there would be any injurious effect.

Q. Is it your opinion that it would have no injurious effect? A. That would depend upon the quantity present.

Q. If it was a considerable quantity, it might have an injurious effect, might it not? A. If enough were taken it might have an injurious effect, but I should expect the injurious effect would be manifested before it reached the liver, if the amount was sufficient to produce an injurious effect. As a matter of fact, if you have enough of this material present to produce these results you are speaking of, it would act as an emetic and be thrown off through vomiting.

Q. You don't mean to say that every dose of this substance, alum, which is not thrown off by vomiting, is necessarily harmless always, would you? Would you say, I mean that as soon as the alum goes into the stomach in sufficient quantity to be of any injury to any organ of the body, it will necessarily be thrown off by vomiting? You would not say that, would you, Doctor? A. No.

Q. Now, that applies to one dose, or one instance of taking alum into the stomach. Suppose that was done day after day continuously for a month, what would you say would be the effect upon the organs of the body? A. If alum was so taken into the stomach, I believe that it would diminish the secretion of the gastric juice and produce constipation, and that the result of this continued reduction in the character of the gastric juice would give rise to indigestion.

Q. Do you think that necessarily, that would be the extent of the damage or injury? A. That would depend on the amount; if the amount was small, I believe that would be the extent of the direct injury.

Q. How large or how small would you put that limit? A. That is not possible to say. If the amount used is not sufficient to produce vomiting, supposing the amount was a fraction of that which would be sufficient to produce vomiting,

then it is fair to presume it would have this action that I have outlined. It is impossible to say just where the physiological effect of one amount commences and ends.

Q. Then you would say it is a question of degree, rather than of generic nature or kind? A. It is a matter of amount.

Q. A great amount might have a very bad effect, a small amount might have no perceptible effect, you mean? A. By small amount what do you mean?

Q. One-tenth of a grain; one grain, two grains, something like that. A I have not studied the effects of alum in these small doses and no one else has, so far as I know, and it is impossible to say what effect it would have.

Q. I understood you to say it is a matter of amount, and you can fix an amount which is a dividing line between something that is harmful on the one hand and something that is not harmful on the other—that is what you said, is it not? A. I said that it is a matter of amount as to what would produce vomiting; matter of amount as to what would produce this indigestion, and the time required to produce the indigestion, because it would interfere, as I have said, with the secretion of the gastric juice.

Q. If in very large amounts? A. The subject has never been studied, it is impossible to say just what effect you are going to get with small amounts, when the facts have not been studied. It is a mere assumption.

Q. But so far as you know, small amounts might be used without serious injury—so far as you know? A. Well, I don't know.

Q. Do you know to the contrary? A. I don't know; it has not been investigated.

Q. Can you say whether that is not true of any substance? You might use arsenic in infinitesimal proportions without serious injury? A. What do you mean by infinitesimal proportions—

Q. One-tenth of a grain? A. Yes—then you would get a marked effect

Q. One one-hundredth of a grain; what effect would you get there? A. You would get a marked effect.

Q. One one-thousandth of a grain? A. I do not know what effect you would get. You would get considerable effect from one one-thousandth of a grain.

Q. I speak of one application, Doctor? A. I do not think you would get a very marked effect from one dose.

Q. That is true of calomel, as well as arsenic? A. In what amount?

Q. One one-thousandth of a grain. A. I do not think you would get a marked effect.

Q. That is true of bismuth? A. I think it is.

Q. Then so far as the generic nature, or characteristic nature of the effect upon the human system of alum, arsenic, calomel and bismuth, is concerned, they are all substances which in very small quantities may be taken for one time into the system without serious consequences? A. Yes.

Q. And when you may reach a point where injury will result, depends upon the amount of each of these things you would use, and the limits vary between arsenic on the one hand and alum on the other as the extreme? A. That is right.

Q. Now, Doctor, you selected two subjects for these experiments; one was Dr. Irish, and the other was Dr. Ross. What is about the age of Dr. Irish? A. Dr. Irish is about 27 or 28 years of age.

Q. What is his physique? A. Good average physique.

Q. Stout, or spare? A. Perhaps, rather spare than stout.

Q. Would you say he was a man of robust health? A. I should say he was a man in good health. I inquired if he was a man of good health and he so stated.

Q. Do you know anything about his habits of life, whether they are active or sedentary? A. It is the average doctor's life, I think.

Q. Practising in the city of New York? A. Practising in the city of New York.

Q. Is that true of Dr. Ross? A. That is true of Dr. Ross.

Q. These gentlemen each received from you one dose—I call it a dose, I do not mean to use an invidious term—on each of these occasions of each of these kinds of bread? A. They each ate a test meal composed of each of these kinds of bread.

Q. I suppose you know that to be the only instance in which they did eat any bread made with an alum baking powder? A. I do not know anything about that; I do not

know really, whether they use alum baking powder or not.

Q. Did not you inquire whether they had been in the habit, before that time, of eating bread with alum in it, or bread that had been prepared with alum baking powder? A. I did not.

Q. So that, as far as your experiments go, Doctor, they would determine only the effect, if any, that would come of one instance of using a baking powder containing alum; that is as far as it goes? A. In these particular experiments, I studied the influence of that meal only.

Q. Now, are you prepared to say, if you had done the same thing to each, or either one of the individuals, every day for thirty days, that you would have discovered no different effect or result than that you did discover? A. I think it would have knocked them out completely.

Q. Do you think that the result upon them is a safe guide, or solution of the question, as to what the effect might be upon a dyspeptic subject, one whose digestion was weak or disordered? A. I think it is difficult to state what the effect would be from a direct experiment upon a dyspeptic, for the reason that the dyspeptic varies so with his moods and at various times. He is not physiological; and, therefore, the study would be difficult in that case.

Q. And something which might not at all derange the digestion of a robust, sturdy person, might seriously upset, or interfere, with the digestion of a dyspeptic, might it not? A. Oh, yes; that is very true.

Q. And the same might be true with reference to the age of the subject, as for instance, between a child of tender years and a grown man in good health? A. That is true.

Q. So that, Doctor, if I understand, you mean to say that you believe the use of an alum baking powder in the preparation of food is a wholesome method and a healthful method, under the conditions under which you have made these experiments, is that right? A. I made no such statement.

Q. I ask you if you mean to express an opinion as to the effect upon any condition other than those which you have tried in this case? A. I mean to say that the food eaten by these individuals produced no ill effect. It is undoubtedly true that the same food eaten by individuals who are not in good health, probably would have produced ill effect. The

amount of bread eaten was considerable, it would probably have upset them, either the control bread or the other bread. If the amount had been fed to a baby, it would have upset the baby.

Adjourned to 10 a. m., Wednesday, January 3, 1900.

Not being able to complete the taking of said depositions by reason of the lateness of the hour, I adjourn the further taking of the same until to-morrow, then to be continued at the same place and between the same hours mentioned in the annexed notice. Howard McWilliams.

Pursuant to adjournment, as above stated, on the third day of January, 1900, between the hours of ten o'clock in the forenoon and four o'clock in the afternoon, at the Townsend Building, Broadway and 25th streets, in the City of New York, I continue the taking of said depositions as follows, to-wit:

State of Missouri,
vs.
Whitney Layton.

Wednesday, January 3, 1900.

Met pursuant to adjournment.

Present, parties as before.

By consent of the parties, Dr. Ernest Ellsworth Smith is withdrawn from the witness stand temporarily for the purpose of examining two witnesses in attendance.

WALTER HOWARD ROSS, a witness called on behalf of the defendant, being duly sworn, testifies as follows:

Direct Examination.

By Mr. Seddon:

Q. What is your full name? A. Walter Howard Ross.

Q. Where do you live? A. Corner of Hewes and Lee avenue, Brooklyn, New York City.

Q. What is your profession? A. General practitioner of medicine.

Q. How long have you been practising? A. One year in private practise.

Q. Are you a graduate of a medical school and if so, what school? A. Bellevue Hospital Medical College.

Q. You went through the regular course there? A. I did.

Q. Now, Doctor, do you remember being associated in any wise with Dr. E. E. Smith, in any experiments? A. I do.

Q. In the latter part of 1899? A. Yes, sir.

Q. What month did that occur in? A. December.

Q. Was that in New York City? A. It was.

Q. Now, what was the general nature of that experiment as performed on you? What did Dr. Smith do to you? A. On two specific occasions I partook of a meal of bread and water. The same withdrawn by a stomach tube at the end of one hour.

Q. Can you state the dates on which you did that? A. December 12, and December 16.

Q. 1899? A. 1899.

Q. You did not know the composition of the bread and water that he administered to you on these occasions, did you? A. No, sir.

Q. On either occasion? A. Neither occasion.

Q. You had seen Dr. Smith previous to both of these dates, had you not? A. Yes, sir.

Q. And had he given you any directions with reference to your diet and conduct during that time? A. Yes, sir.

Q. Do you remember what the directions were? A. To eat my dinner the night before as usual, and to partake of nothing whatever until I was at the laboratory and partook of the meal to be provided there in the morning.

Q. Did you follow all of his directions that he gave you on that occasion? A. Yes, sir.

Q. Faithfully? A. I did.

Q. Doctor, in your experience as a physician, have you had a patient whose diseased condition of the digestive system, in your opinion could be attributed, either wholly or in part to the use of alum baking powder for the preparation of food used by him? A. I have never so attributed any case, and have never given that subject any consideration.

Mr. Seddon: I am through with the witness.

Mr. Cunningham: I do not desire to make any cross-examination.

Walter Howard Ross.

Subscribed and sworn to before me, on the day, at the place and within the hours first aforesaid.

Howard McWilliams.

ROBERT LISTON IRISH, a witness called on behalf of the defendant, being duly sworn, testifies as follows:

Direct Examination.

By Mr. Seddon:

Q. Please state your name, age, occupation and residence? A. Robert Liston Irish; I am 32 years of age; engage in the practise of medicine; residence 270 Halsey street, Brooklyn, New York city.

Q. Do you know Dr. Ernest E. Smith? A. I do.

Q. Did you ever participate in any experiments made by Dr. Smith, in the latter part of 1889, in reference to the use of bread as food? A. I did.

Q. Did you receive instructions with reference to what you should do? A. I did.

Q. Did you follow faithfully the rules and directions? A. Perfectly.

Q. You were very careful to carry out the instructions? A. I was.

Mr. Seddon: That is all.

Mr. Cunningham: No cross-examination.

Robert Liston Irish, M. D.

Subscribed and sworn to before me, on the day, at the place and within the hours first aforesaid.

Howard McWilliams.

ERNEST ELLSWORTH SMITH, re-called for further cross-examination:

Mr. Cunningham: Q. Doctor, you have stated that in your examination of the contents of this can or package, or

these cans or packages which you received by express, you made a qualitative but not a quantitative analysis? A. Quantitative only to the extent of determining the amount of gas evolved, the amount of carbonic acid united in the powders, as sodium bicarbonate.

Q. Now, did you find in that powder alum as such, that is, sulphate of alumina, or did you only determine the presence of the constituents of alum? A. I determined the presence of the constituents of alum.

Q. Not of alum itself? A. That is the way in which you determine the presence of alum, by determining the presence of the constituents.

Q. I mean to ask you that question—now did you or did you not in that analysis determine in that article the substance or presence of alum as sulphate of alumina in that form? A. I think I determined it in the form of sulphate of alumina.

Q. Did you determine it to be there in the form of alum? A. In the form of sulphate of alumina, commercially known as alum, yes, sir.

Q. Did you determine the presence of alum as such? A. I did.

Q. How much alum by way of percentage, you did not determine? A. I did not determine.

Q. Now, when you came to test or analyze the bread that had been made, did you or did you not there find the presence of the constituents of alum, that is to say, sulphuric acid and oxide of aluminum—Is there any difficulty about the answer to this question Doctor, that you delay it? A. I wish to consider the bearing of the tests that I actually made upon my ability to answer that question.

Q. That is the reason of your delay? A. That is the reason of my delay. I tested for the constituents of alum and sulphate only in such way as would show their presence if they were combined as alum, and I did not find them present in such a combination.

Q. As alum? A. As alum.

Q. You speak now of the examination of bread or the baking powder? A. Of the bread.

Q. So that I understand you to say you did find alum present as a specific article or compound in the baking powder, but you did not find alum as a specific compound in the

bread, but that you did in the bread find the constituents sulphuric acid and aluminum? A. I did not find the constituents sulphuric acid and alumina in the bread. I did not test for them in such way as to obtain the knowledge of their presence unless they were combined as alum.

Q. So that for aught you know these constituents were present in the bread? A. For all I know the constituents were present in the bread, but not combined as alum.

Q. And in what combination, you did not determine? A. I did not determine.

Q. And you do not know? A. I do not know except as regards the sulphate. I think I testified on direct examination that that was present as sodium sulphate. That knowledge was obtained, not by direct test however, but by a knowledge of the chemical behavior.

Q. You drew your conclusion from your general knowledge of the subject? A. I drew my conclusion from my general knowledge of the subject.

Q. And did you find specifically the oxide of aluminum in the bread? A. I did not as I made no test for it.

Q. If it was there, you could not tell in what particular form? A. I could not and I believe that no one has ever been able to decide in what form it would be present.

Q. It could be determined, however, by proper test and experiment could it not? A. I hardly think so with our present knowledge of the chemistry of the wheat. I think our knowledge of the chemistry of wheat is insufficient to determine the exact nature of the contents into which the aluminium might enter.

Q. But as to what compounds it had actually entered into at the time of the test or experiment, that could be determined? A. I think not.

Q. You think not? A. I think not.

Q. Would you say anything about whether that might or might not be the hydrated oxide of aluminum? A. I think the chances are—I believe it to be a fact that the aluminium enters into combination with the proteid matter of the flour.

Q. Making a phosphate? A. Making an aluminium compound of proteid mater, not phosphate. It also might enter into combination with the phosphate and make an alum-

inium phosphate, if the phosphate were present.

Q. Doctor, please say what test you applied by which you say you determined the presence in the baking powder of alum in the form of sulphate of almumina? A. The bak-ink powder was dissolved in acid.

Q. What acid? A. Hydrochloric acid, and it was determined that sulphuric acid, carbonic acid, sodium and aluminium were present. The powder was then treated with water, another portion of the powder, and it was determined that the aluminium was insoluble after the reactions had taken place which were brought about by the addition of water to the powder. From those data I concluded that the aluminium was present as aluminium sulphate in combination with sodium sulphate, mixed with sodium bicarbonate. The question regarding sodium sulphate was not determined, that may or may not have been so, and that from this reaction the aluminium had been transformed from the sulphate into aluminium hydroxide and had been rendered insoluble.

Q. Now, Doctor, that is a conclusion from your general knowledge of the subject, and is not a positive direct result of the test to find alum is it? A. It is a result of the direct test to find alum. I will say positively that alum is present in the powder.

Q. I understand you have stated that, Doctor, but I want to see how you arrived at that conclusion. Now do you say that there is no other way by which you could have determined the presence of alum in that baking powder as a sulphate of alumina? A. There are other ways of doing it, certainly. I was merely reciting the way I took to arrive at that conclusion.

Q. I understood you, Doctor, to say in your direct examination, that you had found there the presence of alum as a sulphate of aluminium? A. I so stated.

Q. Now I understand you to say that what you did find were the constituents of alum, sulphuric acid and oxide of aluminium, mixed with or in the presence of carbonic acid and soda, and that from the fact that you found these constituents, you draw the conclusion that the constituents, sulphuric acid and oxide of aluminium, which you did find, must have been when you started in the form of alum or sulphate of aluminium, is that right? A. That is right in part only.

I also determined the fact that the combination of aluminium and sulphuric acid was capable of reacting upon sodium bicarbonate which was present, to liberate gas. Therefore, the sulphate must have been in combination as aluminium sulphate.

Q. Would not the presence of free sulphuric acid in the compound, mixed with the bicarbonate of soda, have evolved carbonic acid? A. It would have evolved carbonic acid before the addition of water.

Q. Would it not with water added? A. The carbonic acid would have been evolved long before I had any opportunity to examine the preparation, if the sulphuric acid had been present as free sulphuric acid. It would be impossible to combine the free sulphuric acid in the form of a baking powder of that nature, without getting an immediate liberation of gas.

Q. If a sulphuric acid had been present in combination with some base, for which its affinity was less than the affinity of the sulphuric acid for the soda, would not you have gotten a reaction in the nature of an evolution of carbonic acid gas from the decomposition of the bicarbonate of soda? A. There are very few sulphates that would react with bicarbonate of soda to evolve a carbonic acid.

Q. I did not ask whether there were many or few, but I will ask you to answer the question as I have put it, yes or no? A. The question seems a little involved to me; can not it be simplified?

Q. I will try. I ask you whether if you take a sulphate composed of sulphuric acid and any base or alkali, the affinity between which alkali and the sulphuric acid is not so strong as the affinity of the sodium oxide for the sulphuric acid, the sodium being present in the mixture as a bicarbonate, whether under these conditions, if you mix that with water, you would not have an evolution of carbonic acid? A. I answer, no.

Q. Now if the sulphuric acid were in that case combined with a metallic base, would there or would there not be an evolution of gas? A. With what metallic base?

Q. Well, any metallic base that the sulphuric acid would combine with, or had combined with? A. Not to my knowledge.

Q. Then as the result of this experiment that you made, I understand you to say that you found the constituents of

alum in the powder and you found the constituents of alum in the bread? A. My statement was that I found the constituents of alum in the powder and that I did not find the constituents of alum in the bread, because I did not test the bread for the constituents except combined as alum.

Mr. Seddon: Q. As free alum? A. As alum.

Mr. Cunningham: Q. What would be the test, Doctor, to show the presence or absence of free alum in bread? A. The test that I used was to treat the bread with water, and to test the solution obtained from which the bread had been separated by filtration, for the presence of the constituents of alum.

Q. How test the solution? A. I tested it for the presence of sulphate by the addition to the solution of barium chloride and hydrochloric acid, and tested it for the presence of aluminium by rendering the solution slightly ammoniacal, and noting whether a precipitate of aluminium hydroxide was formed.

Q. Then in the bread did you or did you not find the presence of both of the constituents of alum? A. I did not.

Q. Doctor, in the presence of soluble carbohydrates in the solution of the bread would ammonia precipitate alumina? A. I think it would, yes, if the alumina were present as alum.

Q. In making these experiments had you any conference or correspondence with the defendant or his attorneys? A. What experiments, may I ask.

Q. The experiments which you have detailed in your evidence? A. I did.

Q. And did you know what was the purpose or object that was entertained by the counsel in having you make these experiments? A. It was stated to me that the purpose of these experiments was to decide definitely by scientific investigation the merits of the question.

Q. The merits of what question? A. As to whether the use of the so-called alum baking powder in the preparation of food was or was not harmful.

Q. Did you know whether a negative or a positive result was desired by the counsel who employed you to do this work?

A. They made no statements to me whether a negative or a positive result was desired.

Q. Did you not know? A. Any knowledge that I had on the subject would be by inference alone.

Q. You did make that inference as a matter of fact did you not, Doctor? A. I inferred that a man who was manufacturing alum baking powder would be glad to establish the fact that he was not poisoning the community.

Q. That the thing which he was doing was a proper and harmless and healthful thing to do? A. Yes.

Q. Would you have testified, Doctor, if the result of your tests and experiments had been negatived or the opposite of the conclusions you have arrived at? A. I stated to the counsel who arranged with me that they would be obliged to abide by whatever results were obtained in the experiments —that I could take no responsibility for the nature of the results.

Q. But as to your testifying in the case? A. That depended entirely upon whether the counsel was to put me on the stand to state the facts I found as the result of my investigations.

Redirect Examination.

By Mr. Seddon:

Q. I would ask the witness whether any influence or attempted influence was brought to bear upon him by the defendant, his attorneys or agents to bias his judgment in making these experiments? A. There was not.

Q. Then I understand you to say that you desired to ascertain the truth about these matters in such scientific way as you and your associates should think would determine fully, in your judgment, the matter? A. That is true.

Q. I do not know whether I brought out clearly, Dr. Smith, in reference to this powder you say you sent by registered mail to Dr. Keizer, whether that powder was a part of the powder that you took out of the cans and actually used in baking the bread for these experiments, or was a part of the consignment of twenty-four cans that you received. Please state the fact? A. It was a part of the powder actually used by me in the experiments.

Q. That is to say, that you had to open some of these

cans to get some of the powder, and that you used some of it, and that there was a surplus there, and of that surplus you sent something to Dr. Keizer, is that a fact? A. That is true. I may state by way of explanation that I opened several cans of the powder and mixed the contents of the cans one with the other thoroughly, and then returned the contents to the cans, and marked the cans No. 1, 2, etc. and that, although the can sent to Dr. Kiezer was a full can, it was a part of the material actually used by me in the experiment.

Q. Doctor, in your cross-examination I understood you to say that you did not know of alum being in any natural product of nature—that it was all of artificial manufacture by man? Have you never heard of the Alum Springs of Virginia? A. I have.

Q. Do you consider that a product of nature? A. I consider that a product of nature. I overlook the fact that alum does occur in water that is drunk by man.

Mr. Cunningham: If you will pardon me, I will not object to your leading up to a thing like that, but I ask you to put the questions in a form not leading.

Q. Doctor, state whether or not a compound of alumina in various forms are found in most drinking waters? A. Compounds of alumina are found in nearly every specimen of drinking water.

Q. How is arsenic, bismuth and calomel classified with reference to their poisonous nature? A. They are classified as poisons.

Q. How is alum classified with reference to its nature? A. Alum is not classified as a poison. It has never been known to produce death in man.

Q. In your cross-examination you made the statement that if you had continued your experiments on the two doctors on whom you made your experiments, for thirty days that it would knock them out. What did you mean by that statement? A. I stated that if the experiment were repeated on the subject for thirty consecutive days that the subject would be knocked out, meaning that the nature of the experiment was of such a kind that it would entirely upset the subject.

Q. Why? A. The reason being that the subject is obliged to go without his breakfast in the first place. In the

second place he is given little to eat and then asked to undergo the passing of the stomach tube, which in these subjects, they not being accustomed to the use of it, would not have been very well received through such a period and would have caused disturbances.

Q. State whether or not you wish it to be inferred from that answer that they would be knocked out, that they would be affected, injuriously or otherwise, by the use of the bread as a bread? A. I state that the bread would have had no action upon them other than that of a good wholesome article of food.

Q. You testified yesterday with reference to alum that it was manufactured with the use of sulphuric acid, did you not? A. I do not remember whether I so testified or not, but that is acknowledged to be the process of manufacture of alum.

Q. I ask you to state whether or not in the baking powder made with this alum there is any sulphuric acid? A. There is no sulphuric acid present.

Q. Assuming of course that this baking powder is made of bicarbonate of soda, and sodium sulphate of alumina—alumina sulphate? A. There could be no sulphuric acid present anyway, because it would not remain unchanged in contact with the bicarbonate of soda.

Q. Well, I mean to say before it is mixed with water or mixed with dough? A. It could not remain even in the dry condition.

Q. In other words the sulphate of alumina, though manufactured by the use of alumina and sulphuric acid, forms chemically a different compound from alumina or sulphuric acid, does it not? A. An entirely different chemical compound.

Q. State whether it unites in mechanical or chemical union, and what is the difference in the affect—does it change the nature of the product? A. It unites in chemical union. The difference between the mechanical and chemical combination, is that when chemical combination is effected, the body formed has properties of its own, and in those cases does not possess any of the characteristic properties of the substance which have united to form the compound.

Q. What is the composition of common table salt, and how is it made? A. Common table salt is a composition,

a compound, of sodium and chlorine, and may be made by the action upon sodium, or upon sodium hydroxide, of hydrochloric acid—known in the arts as muriatic acid.

Q. Though made with these elements, the common salt is an entirely different product from any of the elements? A. It is a different product; it is a product which has resulted from chemical action.

Q. State whether muriatic acid is a harmful or good article— A. Muriatic acid, as it occurs in commerce, is a strong corroding acid, acting as a poison, destroying tissue if it comes in contact with it. Like oil of vitriol if dilute it can be taken into the system and will not there have that same harmful action.

Q. State whether or not you find present in the constituents of the human body sulphate of sodium? A. Sulphate of sodium occurs in the urine, occurs in the blood, and in other organs—in various organs of the body.

Q. One of the natural constituents? A. One of the natural constituents of the body.

Q. What is sulphate of sodium composed of—how is it made? A. Sulphate of sodium is a salt made by acting upon sodium or sodium hydroxide by sulphuric acid or oil of vitriol.

Q. As you understand it, what is the nature of the reaction which takes place in such a baking powder as the Layton, which you testified did not have an excess of alum, when it is mixed with water, and state whether after such reaction there is present in the mixture any sulphuric acid? A. When water is added to a mixture like the baking powder in question the aluminium sulphate present reacts with the sodium bicarbonate present and forms, after the reaction takes place when the powder is treated, not in bread, but by itself, sodium sulphate, carbonic acid, aluminium hydroxide. No sulphuric acid is formed at all.

Q. To your knowledge has it ever been ascertained in what form the alumina exists in a loaf of bread that has been cooked with such a powder as you have referred to? A. It has not to my knowledge.

Q. Does or does not the bread contain any constituent elements with which alumina tends to form an insoluble compound? A. Aluminium oxide or hydroxide tends to react with proteids. Of these there are a number present in bread.

There is therefore good reason to believe that the aluminium does react with such substances in bread.

Q. That is to some extent—to an extent unknown? A. To an extent unknown.

Q. Would such a combination tend to render the alumina element insoluble? A. It would.

Q. In reference to the use of this bread by dyspeptics my learned friend Mr. Cunningham asked you some questions on that subject. Perhaps I did not understand your testimony, but I should like to ask you whether you can state from the data on the results of your experiments which you have described, whether the bread manufactured with the Layton powder would be as healthful as the bread manufactured according to the Liebig process which you spoke of as considered an ideal bread. Please answer that question? A. In my opinion the use of the alum powder in the preparation of the bread would in no way render it unfit for eating by persons with disordered digestion.

Q. Did you infer that from the experiments that you have made and which you have described? A. I believe that to be true because we have found in our experiments that such food has a normal physiological action on the system.

Q. Having a normal physiological action upon the system, you then infer from your experiments that it would be as wholesome as any other bread? A. That it would be as wholesome as any other bread.

Q. Do you consider a bread diet of any kind a very wholesome thing for dyspeptics? A. I do not particularly fresh bread; that is recognized and is known to be injurious in cases of disordered digestion.

Q. Then state whether or not, if you found a person of weak digestion had been affected by the use of such bread as the Layton bread, you would attribute it to the use of the baking powder or to the use of bread as such? A. I should attribute it to the use of bread as bread, and not to the use of the alum powder in the preparation of the bread.

Q. You were asked on cross-examination what effect the use of an alum baking powder in preparing bread might have upon a child taking the bread. Up to what age can a child take bread at all? A. Children should not be fed bread until they are about one year of age.

Q. Why? A. Because not until that age do they

develop in the body the power to secrete the ferments that are essential for the digestion of carbohydrate food.

Q. What would you infer from your experiments, if anything as to the comparative wholesomeness of feeding to children what is known as alum baking powder bread, prepared as you prepared this in your experiment, compared with what you have testified as being generally considered an ideal bread? A. I believe the action to be the same.

Q. And being questioned on your cross-examination in reference to the influence of administering repeated doses of alum through a considerable time, I understood you to state that the natural effect would be to produce a state of constipation. I will ask you whether or not that would not depend upon the size of the dose? A. It would depend entirely upon the amount of the alum taken.

Q. Is it not a fact that some substances are known, when taken repeatedly in very small doses, to accumulate in the system and to produce serious effects by reason of such accumulations, and others are eliminated by the kidneys and other organs of the system the same as other effete matter? A. That is true.

Q. To which class of these articles does alum belong? A. So far as I know, no direct experiments have been made to determine whether alum accumulates in the body. It is my belief that if it did accumulate to produce harmful results, that it would be known.

Q. That it would have been known? A. Yes, sir.

Q. I should like to ask if you know what is the general medical opinion on that question? A. So far as I know there is no general expression of opinion on that subject. I believe it is generally assumed that if the alum is taken into the system it is quickly thrown off.

Q. You think that is generally assumed? A. I think that is common knowledge.

Q. So then you say that you think the influence on the human system, of taking alum repeatedly, during a considerable length of time, would depend altogether upon the amount of the dose? A. It would.

Witness withdrawn for the present to be recalled for recross-examination.

AUSTIN FLINT, called as a witness on behalf of the defendant, being duly sworn, testified as follows:

Direct Examination.

By Mr. Seddon:

Q. What is your name? A. Austin Flint.

Q. Where do you reside? A. 60 East 34th street, New York City.

Q. Please state your age? A. My age is 64, nearly.

Q. Did you ever graduate at any medical college, if so, please state where and when? A. I graduated at the Jefferson Medical College, in Philadelphia, in the year 1857.

Q. Did you receive any degree? A. I received the degree of M. D., and received a degree from the same college of LL. D., about ten years ago.

Q. What is the degree of LL. D.? A. Doctor of Laws.

Q. How long have you been in practise and where have you practised? A. Since 1857. Practised in Buffalo, New York from 1857 to 1859. Since 1859 have been a resident of the City of New York, and a practitioner in that city, with the exception of one winter in New Orleans, in 1860—61, where I was professor of Physiology in the New Orleans School of Medicine.

Q. How many years have you spent in literary work? A. I have spent my whole life in literary work. I edited the Buffalo Medical Journal and the New York Medical Review for over fourteen years. I am the author of a system of human physiology in five volumes which took eleven years to write.

Q. What is the style of that work? A. It is entitled "Physiology of Man." The first volume was published in 1866 and the last volume about ten years later. I also wrote a text book of human physiology which has been through four editions, and sold about 21,000 copies. I have also written a work entitled "Chemical Examination of the Urine in Disease" and another work "Sources of Muscular Power." I have written a monograph on a new function of the liver which received honorable mention and a recompense of fifteen hundred francs from the Institute of France, about 1866, the foundation of the Monthyon Prize.

Q. You are the author of various other articles? A. Various other articles, papers, etc.

Q. Have you had any connection with medical colleges other than you have stated in New Orleans? A. I was professor in the medical department, university of Buffalo, from 1858 to 1859; in the New York Medical College 1859 to 1860, and in the New Orleans School of Medicine from 1860 to 1861. I was one of the founders of Bellevue Hospital Medical College in 1861, and was professor of Physiology in that institution up to 1898, and previously for eight years in the Long Island College Hospital. I am now professor of Physiology in the medical department of Cornell university.

Q. Have you been connected with any hospital? A. I was surgeon of the Buffalo General Hospital in 1857 and 1858, and during the war was acting assistant surgeon in the Ladies' Home Hospital in the City of New York. I was visiting physician for a great many years to Bellevue Hospital, and am now consulting physician to the same. I was visiting physician for the Insane Pavilion Hospital for two years. I am a member of the consulting board of the State Hospital; I am president on the consulting board of the State Hospital.

Q. Have you ever been connected with any medical societies? A. I am a member of the American Medical Association; the New York State Medical Association, of which I am an ex-president, and am now president of the member of the Philosophical Society of Philadelphia; member of the Medical Psychological Society and an honary member of other societies.

Q. Are these associations and societies that you mentioned leading and important bodies? A. They are.

Q. Have you received any public recognition of your work here or in foreign countries? A. I was surgeon general of the State of New York, which at that time was an honorary position, under Governor Tilden and Governor Robinson. I received this honorable mention from the Institute of France, referred to previously and I received the decoration of the Order of the Liberator of the Five Republics of Venezuela. I think that was in 1893.

Q. For what? A. As stated in the declaration "For services to science and humanity."

Q. Then I understand that your whole business life

has been actively devoted to the medical science? A. It has, and expecially to physiology, and lately to mental diseases.

Q. Have you had any experience and devoted much time to matters relating to food and diet? A. I think it was in the year 1867 that I gave the diet for the inmates of the institutions under the care of the Commissioners of Charities and Corrections, amounting to about ten thousand persons. In 1893 I gave the diet for the inmates of the different State Hospitals amounting to about 18,000 persons. I have studied the subject of bread, particularly in connection with diabetis, preparing it as a diabetic bread for many years. I was engaged in 1869 in the so-called Horsford-Hecker suit which involved the nutritive qualities of bread made from certain baking powders, and I made in 1870 a series of experiments on metabolism which were regarded as of considerable importance

Q. Now Dr. Flint, do you know Dr. Ernest Ellsworth Smith who has testified here in this proceeding? A. I do.

Q. Have you been present during the whole of this examination at the present time? A. I have.

Q. Have you hear every word that he has stated on the stand? A. I think I may say so.

Q. You were sitting right near him? A. I have been present and heard every word, I presume.

Q. Now, please state what connection you had with the experiments that Dr. Smith has described? A. Without giving the exact dates, which I might give by reference, which I do not think are absolutely essential, I was called upon in October by Dr. Smith and Prof. Austin and Mr. Stoner and we had a preliminary talk with reference to investigations which were desired to determine the nutritive value of bread made from, as it was stated to me, alum baking powder, so-called, as compared with other breads, breads recognized as good wholesome breads. In this conversation, having some views upon the use of alum, particularly as added in the manufacture of ordinary breads, I consented to look up this subject and give an answer as the result of thought and looking up the subject, as to whether I would engage in such an investigation. I subsequently agreed to engage in such an investigation, and had a conference with Dr. Smith in which, as the result of such conference and consultation a plan of investigations was laid down, this plan being in

my judgment in accordance with recognized scientific methods and methods which I myself employed. Dr. Smith was to carry out the investigations in accordance with this plan and to consult with me from time to time, indicating the results of his investigations or their progress, with a view of modifying this plan if it should seem desirable. The investigations were carried on in that way. The plan was not modified —

Q. I will ask you whether or not in your investigations, in your opinion, you found that any proper physiological experiments had been made upon the human system to ascertain these facts which you were in search of and whether or not you considered and do now consider a chemical or a physiological problem, and if physiolgical why? A. To my knowledge there were no connected investigations of this character according to the plan laid down, and I consider that the question involved was more largely physiological than chemical, and the plan was laid out in accordance with that view. The plan involved determining upon human beings the effects and differences if any, from investigations made with ordinary bread—the effects of this bread upon, first, the quality and quantity as regards activity of the gastric juice; second, the completeness and rapidity of stomach digestion; third, the completeness of the absorption of digestive materials and the proportion of the constituents of the bread prepared by digestion for absorption; fourth, the influence of this diet, composed largely of the bread, upon what is known as metabolism, which include as anabolism, which means the proportion of nutritive matter taken by the system, and catabolism which means the throwing off of effete matters. All of these experiments were to be made in comparison with identical experiments made with a bread which was assumed to be and is recognized as being an absolutely normal bread.

Q. You heard Dr. Smith testify as to how he prepared what he calls his control bread. What is your opinion as to that bread being wholesome, normal bread for the purpose of making the comparison which he made? A. That bread is an ideal bread of comparison. It is made practically by raising with chemically pure hydrochloric acid and sodium bicarbonate, the result of the reaction being carbon dioxide in bubbles, which raises the bread, and common salt, which is added to the dough in the manufacture of all bread. I wish to state here, if the counsel pleases, that I do not qualify as a

chemical expert. I qualify simply as an expert on physiological questions and questions of alimentation.

Q. Now, Doctor, you heard Dr. Smith's testimony? A. I did.

Q. Assuming the truth of Dr. Smith's testimony, state whether or not in your opinion these experiments have been properly carried out and with scientific precaution? A. In my opinion the experiments as I followed them in their progress, and as I heard them testified to here, were carried out properly, accurately, and in every way are entitled to confidence.

Q. Now assuming the truth of Dr. Smith's testimony, please state what is your opinion as to the wholesomeness of the bread that he has called the Loyton bread, which he described as prepared with the so-called Layton powder, as a diet for man? A. Assuming Dr. Smith's testimony as to the facts to be true and looking at the question from what I believe is a purely disinterested scientific point of view, I should regard the bread designated as the Layton bread unquestionably as a wholesome bread used as an article of food for man.

Q. State what, in your opinion, is the value, with reference to wholesomeness of this bread to all classes of consumers —those of strong digestion or weak digestion? A. I should regard it as not differing from any other bread; the selection of bread being largely a matter of individual taste.

Q. In other words, do you consider it a wholesome bread in every respect as a diet for mankind? A. I do, if properly and carefully made.

Q. You say the same thing of all other breads? A. I would say the same thing of all other breads.

Q. How would you classify arsenic, bismuth and calomel in reference to their poisonous nature? A. All of these are classified in the list of poisons in the books.

Q. How would you classify alum with reference to the same specification? A. Alum is not classified in the books as a poison.

Q. State whether or not in your opinion if alum is taken in continuous doses it tends to accumulate in the human system and to produce the therapeutic effects of large doses thus accumulated? A. It is by no one to my knowledge, regarded as a cumulative substance.

Q. Are there other substances used in medicine which, taken in repeated small doses, are recognized as having a tendency to accumulate in the system? A. There are.

Q. Doctor, in your experience as a physician you state that you have given a good deal of study to the matter of food and diet-digestion and indigestion. State how many patients you have had, if any, whose diseased conditions of the digestive system in your opinion could be attributed, either wholly or in part, to the use of food cooked with alum baking powder? A. I have never made any inquiry in that direction. I never have heard any cases of indigestion attributed to that cause by patients, either in private practice or in practice in Bellevue Hospital, which receives a large number of persons who presumably use baking powder, and probably the cheaper baking powders.

Q. You infer that you think from the class of patients that you treat there? A. In the Bellevue Hospital there are the poorer classes; it is a pauper hospital.

Q. Have you ever in your experience as a physician been led to attribute any functional disorder or diseased condition of any tissues to the use of alum baking powder in the preparation of food? A. I have not.

Q. Do you know of any recorded instances in medical literature? A. I do not.

Cross Examination.

By Mr. Cunningham:

Q. Doctor, you have said in your direct examination that you gave or prescribed diets for the inmates of some institutions under your care? A. Not directly under my care, but at the request of those having charge of such institutions. For example at the request of the Commissioners of Charities and Corrections of the City of New York for their penal and charitable institutions, and at the request of the State Commission in Lunacy for the State Hospitals. I had no care or charge of those persons.

Q. Exactly. Did you ever prescribe such inmates a diet of bread prepared with alum baking powder? A. All of those institutions having large baking plants, it was understood that the bread was bread baked in these institutions and raised with yeast.

Q. Not with alum baking powder? A. Not with any baking powder.

Q. So that so far as your advice or direction was concerned, you never authorized or suggested the use of any alum baking powder? A. I simply fixed upon a proper, as it seemed to me, quantity of bread without indicating in any way how that bread should be made, except directions as to how long after baking it should be used.

Q. Have you ever, Doctor, recommended to any patient the use of bread prepared with alum baking powders? A. I have not, and I have never made any suggestions in regard to bread except as regards bread particularly adapted to diabetics.

Q. And do you say that bread prepared with alum baking powder is good or proper for such subjects? A. Diabetic bread so-called is bread from which the starch has been eliminated as largely as possible. It is known as a gluten bread. The ordiary bread contains about sixty per cent of starch and a bread that can be eaten, that is palatable, by diabetics must contain four or five per cent, and it is difficult to get bread that does not contain ten to fifteen per cent of starch. It is simply with reference to the starch contained in the bread that any change is made in the alimentation of diabetics.

Q. If a question should be put to you as to the propriety of using in the preparatin of such bread an alum baking powder, would you prescribe it? A. I should say there is no objection to it—you might use any baking powder, any properly prepared baking powder, whether alum or cream of tartar, which are the two baking powders as I understand it that are in general use.

Q. A baking powder properly prepared, now what do you mean by that? A. Where the proportion of the two elements that react, namely, the element which sets free the carbon dioxide and the element or compound which furnishes the carbon dioxide, are properly adjusted.

Q. So that the reaction that should take place will break up the two? A. Will be practically complete.

Q. It will not leave any bicarbonate of soda and it will not leave any sulphate of aluminium? A. Will leave practically no excess of either of those substances.

Q. What would be the result in your opinion of the

use of a baking powder in which the proper quantities of bicarbonate of soda and of alum were not present in exact proportion? A. If the sodium bicarbonate were in excess I should imagine that some would remain in the bread and make it less agreeable to the taste. If the sodium of potassium, alum, were in excess, I do not know what would be the result. These substances I believe would be changed in the process of baking to something else and would not remain as alum. I simply give that as my impression. I have already said I do not qualify as an expert chemist—all the chemistry I know is that which is necessary for me to know as a physiologist and not, perhaps much more, if any.

Q. What would be the physiological effect if an excess of alum unneutralized by the bicarbonate of soda got into the stomach? A. It would depend upon the quantity. If the quantity was very small it might have no effect. If the quantity were considerable, more than ten grains at any one time, I should think it would disturb digestion.

Q. In what way? A. I should think it would interfere with the secretion of the gastric juice, interfere with its efficiency, and would disturb stomach digestion—would render it imperfect and retard it.

Q. Would there in any such case in your opinion be any interference with the action in the stomach of the peptic ferment? A. Certainly—I mean that when I say would interfere with stomach digestion, which is carried on by the peptic ferments in the presence of hydrochloric acid.

Q. You think it might interrupt the secretion of the hydrochloric acid of the ferment? A. No.

Q. That would go on? A. I think it would be more likely to retard the secretion of the persinogen, which is changed into pepsin by the action of the hydrochloric acid, than to retard the production of hydrochloric acid. These two substances, one pepsinogen and the other hydrochloric acid, are produced in the stomach by entirely different salts. That is merely a matter of opinion, drawn from my general physiological knowledge as regards stomach digestion.

Q. Suppose that more than ten grains of the alum should pass out of the stomach in a soluble state, what would be the effect physiologically? A. It would pass into the blood, and it would be eliminated from the blood by the

kidneys principally. Some of it would be arrested in the liver and probably pass into the bile. Some of it would be arrested in the spleen. It is on record that Orfila found alum eliminated by the urine and arrested in the liver and spleen. Whether he found it as alum or as some other compound of aluminium I do not know.

Q. As it went along in the blood what effect would that amount of alum have upon the tissues with which it might come in contact? A. I think none. I think the therapeutic influence of alum, except as a mere local astringent, after getting into the blood, has been exaggerated. It has been administered in medicine in doses of from eight to forty grains in cases of hemorrhage of the stomach, where it would act locally; in cases of hemorrhage from the bowels, where it would act through the blood; in cases of hemorrhage from the lungs where it would act through the blood; in cases of apoplexy where it would act through the blood. It is my opinion that the influence of alum absorped in the blood and circulating in the blood has been exaggerated, and probably the influence is nil. But its local influence as an astringent upon the blood vessels of the stomach in hemorrhage from the stomach is undoubtedly valuable.

Q. To arrest hemorrhage? A. To arrest hemorrhage. I have myself used it for that purpose and the hemorrhage has ceased. Reducing the matter to strict scientific accuracy it is impossible to say if the alum stopped it or the hemorrhage would have stopped anyway; but presumably the alum had a good effect.

Q. As an astringent? A. As a local astringent.

Q. Upon an organ that was diseased or upon an organ in a normal condition? A. Upon an organ in which there was hemorrhage from the capillary vessels—an organ necessarily diseased.

Q. You would not mean to say that the effect of such alum upon the same organ which was performing its function normally would be beneficial? A. I never have assumed that it is beneficial.

Q. I am asking you to say? A. Oh, no, it is administered medicinally in this instance, and is also administered occasionally for diarrhœa. Although it is a substance little used in therapeutics, except as burnt alum for insufflation and various applications about the throat where the astringent

action is called for and external use where astringent action is called for.

Q. Applied as a medicine? A. In therapeutics.

Q. And not as a food? A. No.

Q. You have testified that alum is not classified in the books as a poison? Is it classified in the books as a food? A. Certainly not. In the large medical dictionaries and dispensatories there is a long list of poisons, their character, their poisonous doses and their antidotes and I answered in the direct examination that certain substances enumerated to me, which I do not now recall entirely, are classified as poisonous, in such lists, alum is not to be found.

Q. Under what classification would you say that alum does appear in the books? A. Alum appears as an astringent in doses of from eight to forty grains, and as a mechanical emetic in doses of from one to two drachms.

Q. With what tests as appearing in the literature of this subject are you familiar, Doctor? I mean as to the effect of alum taken in continuous doses as was asked in your direct examination? A. I know nothing in the literature bearing on that subject of alum taken in continuous doses.

Q. I understood you to say that by no one, to your knowledge, does it appear to have been regarded as cumulative in the system? A. That is the fact.

Q. That indicates that you have seen no tests or opinions recorded to that effect, or no opinions or tests recorded on the subject? A. The answer was purely negative. I have never seen anything on that subject. No one has appeared in the literature who has stated that alum is a cumulative substance taken for a long time, and no one has made a statement in the opposite direction. Nothing is said on the subject of its being cumulative or not being cumulative by any one so far as I know.

Q. You do not know, then, of its ever having been demonstrated to be non-cumulative? A. The answer that I gave before in my judgment is complete. There is nothing in the literature that I know of on the subject as to whether it is cumulative or not cumulative. Under these conditions I, with others, would regard it as a substance not cumulative on the ground that, if it were by any one considered cumulative, that would appear in the literature.

Recess Until 2 P. M.

After Recess.

AUSTIN FLINT resumed the stand and cross-examination continued.

By. Mr. Cunningham:

Q. Why, Doctor, in your opinion if it were cumulative, do you think that it would appear in the literature, and if non-cumulative it would not appear? A. Because it would be a very remarkable statement that it was cumulative—there are very few medicinal subjects that are now recognized as cumulative.

Q. You speak, Doctor, of having treated patients and not having found any of them who, to your knowledge, were suffering from the effects of eating bread prepared with alum baking powders. If that is true, I suppose that very many ailments of the patient proceed from causes which neither the patient or the physician does or can trace logically, is it not? A. That is true.

Q. So that for aught you can say many of the patients whom you have treated, say for indigestion or for constipation, might have been in that fix from causes that you can not now speak of? A. I never made any inquiry one way or the other. I have no knowledge on the subject at all. They may, within the range of possibility, and may not.

Q. It is true, is it not, in your experience as a physician that these two troubles, constipation and what we call dyspepsia or indigestion are very common troubles, are they not? A. They are common among the higher classes; but they are not common in the laboring classes, those that I see in the hospitals.

Q. Do you mean among men or women who lead physically active lives, or do you mean to distinguish between the poor and rich in that regard? A. I should distinguish between the poor and the rich. In the hospitals there are few cases of obstinate dyspepsia or obstinate constipation, not traceable to easily ascertainable organic causes. By that I mean serious disease of some organ of a structural character.

Q. In your opinion would or would not the action of free alum in the stomach affect more seriously a patient who

was subject to constipation and dyspepsia than one who was robust and healthy and free from those troubles? A. In my opinion the presence of free alum or any foreign substance that is to say substance foreign to nutrition, would affect a person of feeble digestion more than it would affect a person of robust digestion. That is a self-evident fact from a scientific point of view.

Q. You understand that these experiments which were conducted by Dr. Smith, which you have heard him detail, and concerning which you have spoken in general terms, were experiments made with a marked sample of baking powder and not from baking powder bought in the market do you not? A. I understand as Dr. Smith testified that he received this baking powder marked in the way to which he testified by express from some person whose name I forget. It was not baking powder bought by him in the open market, as I understand it.

Q. Now, in the opinion which you have expressed, touching these experiments and the result of them, I understand you to confine yourself to the actual case in hand, and not to express an opinion as to what would be the result if an alum baking powder of some other kind, or any other alum baking powder was bought and subjected to like tests and experiments? A. Of necessity to the actual case in hand; having no other data.

Q. You do not mean to express the opinion then, doctor, as a general proposition that the use of alum baking powders in the preparation of bread to be used as food is a thing in itself safe or healthful, do you? A. I do; I think it is a thing in itself safe and healthful.

Q. As a general proposition? A. As a general proposition.

Q. For any alum baking powder? A. So far as I know for any alum baking powder.

Q. No matter what the constituents? A. Assuming that it is an alum baking powder made according to my standard properly.

Q. Did you impose that condition upon the case on which you express an opinion? A. Certainly I did.

Q. It must not have any excess of alum or of sodium bicarbonate? A. Must not have any considerable excess.

Q. Would you fix a degree of excess as the test, to your

answer? A. I should say an excess of alum of five grains to the pound of bread would not be injurious, basing it on the fact that in the Liebig bread a slight excess of hydrochloric acid is added so as to insure the complete decomposition of the sodium bicarbonate. I should fix on the spur of the moment an excess of five grains per pound; and if you choose I will give you my reasons.

Q. Yes. A. My reasons are that Wamklyn, who is an authority on the subjects of breads and their adulterations deducts one and one-half grains of chrystallized alum from the estimates of alum present in bread as an adulteration, or to cover the impurities in damaged flour, as a sum to be deducted from the alum found; it having been found that unalumed bread of the best kind contains enough aluminium to represent one and one-half grains of alum; and that Bell, another writer on the same subject, deducts for this, which may be called a normal alum, two and one-half grains per pound, and that an adulteration of bread by alum should reach about ten grains of alum per pound to be what would be regarded as a considerable adulteration. I am speaking now of the adulteration of bread made by the yeast raising process. These are my reasons for fixing upon that amount upon the spur of the moment.

Q. Then you would regard less than five grains of alum per pound of bread as not an adulteration of the bread? A. If by adulteration you mean the adding of a foreign matter, that is one thing; if by adulteration you mean the adding of an injurious foreign matter that is another thing. As for example, liquors are adulterated with water, and this is called adulteration, still ordinary drinking water is not regarded as a deleterious potable article. But I should say that to ordinary yeast raised bread more than two grains of alum to the pound of bread would be regarded as a substance added.

Q. Would you say it was deleterious or non-deleterious? A. My opinion is up to five grains it would not be deleterious; that is my opinion.

Q. Founded upon any particular tests or experiments you have made or seen made, or from the general literature? A. From the general literature, for the reason that any bread adulterated with alum it is my belief that the alum or compound of alumina is not in the form of what is known as alum but in some other form.

Q. But assuming it to be in the form of alum, would you say you would regard more than five grains of alum to the pound of bread a deleterious adulteration? A. I can not assume that it is in the form of alum, for I do not believe, in the process of raising and baking, that the aluminium compounds could retain the form of alum. I do not believe it is possible.

Q. Then, doctor, do you decline to answer the question as I put it. It is a hypothetical case I understand, but I ask your opinion upon it? A. Assuming that five grains of alum, as sodium of potassium or alum, existed in that condition in bread, I should regard it as deleterious; assuming it to be free alum.

Q. You would not, Doctor, I presume, undertake to say, as a general proposition, that the use of alum, not in baking powders but in bread is a safe and wholesome thing, would you? A. I do not say it is a safe and wholesome thing, but alum is introduced as a bread adulteration almost always, if not always for the purpose of covering up the bad qualities of damaged flour. These bad qualities of damaged flour are simply masked, but they nevertheless exist and I believe that in breads of that kind—and that I think is an opinion entertained by many high authorities on the subject—the disturbances of digestion are due to the damaged flour used in making the bread, and not to the alum which is used to cover up this damaged flour and make a good looking bread out of a bread which would be disagreeable in its appearance and taste if the alum had not been used.

Q. By which I understand you to mean that that would be a matter of deception, rather than a direct poisoning? A. It would be a matter of deception to make what is bad appear good.

Q. And that is the effect of using alum with damaged or inferior flour? A. It is, and recognized, I believe, universally.

Q. And by many eminent scientists and medical men that use of alum for that purpose is condemned, is it not? A. Condemned most positively.

Q. You do not know, I presume, Doctor, whether or not this sample that Doctor Smith used of the baking powder corresponds to any commercial article sold, do you? A. I have no knowledge on that subject.

Q. So far as you know as a matter of fact some other than the particular sample that he used, if used, might have led to quite variant results? A. I have no knowledge on the subject except of the baking powder used.

Q. But I say for aught you know some other baking powder might had led to quite diverse results? A. I would not hazard any opinion on that subject. Of course it may have led to quite different results or it may not have done so. I have no opinion on the subject.

Q. Have you ever studied particularly the subject of the effect upon the health of the use of alum in food? A. I have not, except in the literature.

Q. Now, in the literature on that subject, there are many reputable opinions that it is injurious, are there not? A. There are.

Q. Are you the head of a family keeping an independent menage or establishment, Doctor? A. I am.

Q. And do you use alum baking powders in your family? A. I think not. I think we use no baking powder. My bread is supplied by a French baker.

Q. Do you know anything of the class of people by whom, as a matter of fact these alum baking powders are most used? A. I do not know anything about it positively. I will give you my impression if you choose.

Q. No, not unless you know? A. I do not know anything about it.

Q. Have you given any attention, Doctor, to the usual methods of manufacture or preparation of the alum of commerce? A. Not at all. I now nothing about it except form general reading.

Q. Do you know, Doctor, of its occurrence as alum in any natural food article or product. I mean something that is not manufactured at all? A. Aluminium—

Q. No, alum: the question was alum? A. Aluminum is found according to high authority in good bread, yeast raised, properly made from good flour, not alumed, in the proportion of about one and one-half grains to a pound of bread. Whether that aluminium exists in such combination as to constitute alum or not I do not know.

Q. Do you know from what constituent of the bread the aluminium you speak of proceeds? A. I do not know; I do not know if it is known.

Q. Has it ever been found to your knowledge in wheat grain or the grain of maize? No; and the aluminium found in the bread, as it has occurred to me, might have been part or entirely from the water used in the preparation of the bread.

Q. Then you don't know of its occurrence in any cereal growth, or in any fruit used as food, or any animal tissue used as meat for food? A. I do not know; it does not exist, to my knowledge in the human body.

Q. Would you say that alum is in itself nutritious? A. By no means.

Q. As a general proposition then, Doctor, do you say that the use of alum in food is healthful and safe? A. That is my opinion, that is, in the way—

Q. General proposition is the way I put it. (Question repeated.) A. Alum, as alum, in food, I should say was not healthful. As regards safe, in respect to danger of death, I do not think it could produce death.

Q. Is death the only evil that you think would not come? A. I qualify it. I think that alum taken by itself with food and getting into the stomach as alum, in the quantity of say five grains three times a day, and this done repeatedly for an indefinite time would produce serious disturbances of digestion.

Redirect Examination.

By Mr. Seddon:

Q. When you say that it would produce serious disturbances of digestion, you assume that the alum that would be taken into the stomach from the use of bread is free alum, such as sodium alumina sulphate, potassium alumina sulphate, or some other form of free alum, did you not? A. No; I assumed that alum as free alum is taken into the stomach, not as a constituent of any article of food, but with the food; that is to say, with a meal a person takes five grains of alum dissolved in water and swallows it.

Q. As an excess of alum, I mean by excess of alum a proportion of alum in the baking powder which is not neutralized in the dough, do you wish to mean that it is your opinion that that goes into the cook's bread as free alum? A. My opinion is, it does not.

Q. State whether or not your opinion is predicated upon the hypothesis that a pure bread has been mixed with

alum after it is based and then taken, and that it produces this effect? A. My opinion is based on the hypothesis that the alum is taken with the food, but not incorporated with the food; added to the food as pure alum and not an ingredient of any of the articles of food.

Q. You were asked as to whether you used an alum baking powder in your family. I will ask you whether after having made these experiments, you would object to the use of alum baking powder, proper alum baking powder, in your family? A. I should not object to it.

Q. In speaking of foods you said that you knew of no natural product, used as a food, in which alum appeared as a constituent. Do you consider water as a food? A. Strictly water and oxygen are foods; water particularly.

Q. Have you any opinion as to the presence of alum in drinking water? A. I have no experience of it.

Q. What is the scientific knowledge on the subject if any? A. I think that alum is contained in very minute quantities in ordinary drinking water.

Q. In many forms of drinking water? A. That is my opinion.

Q. Do you know anything of the process of filtering water with alum for use as drinking water? A. I know that it is sometimes used for the purification of water; I assume it to be used because it has an affinity for certain organic matter.

Q. Has not that passed into the domain of scientific matters, that water is purified on a large scale by the use of alum for the purpose of being used as matter in consumption of food? A. I think that is correct.

Q. Don't you know as a scientific man that is correct? A. I will state that from actual knowledge. I think every one who studies the subject of foods knows that.

Q. It is a matter of scientific knowledge? A. It is a matter of general knowledge.

Q. Did you ever hear of the alum springs of Virginia? A. I have, but knew nothing of the effects of this water.

Q. Don't know anything about them? A. Nothing except that I have heard of them.

Recross Examination.

By Mr. Cunningham:

Q. Would you, Doctor, admit to use in your family an alum baking powder merely as you would know it to be an alum baking powder on the market without any particular knowledge of your own as to whether it was, as you say, properly prepared? A. I would admit to use in my family from what I have learned in these investigations this Layton powder, assuming that this Layton powder is represented by the powder which was used. In all probability—I state this from experience —my family would not stand it for the simple reason that it is ten cents a pound and according to the standards of some housekeepers anything that is cheap is not as good as anything that is dear. I state that feelingly.

Q. Doctor, I suppose that you mean, when you state your willingness to use an alum baking powder in your family, such a powder, and you do not mean any other powder than such as was experimented upon by Dr. Smith? A. I mean a powder that would be presumably a properly prepared powder, as some might have a preference, just the same as in regard to the cream of tartar powders; some have a preference for the Royal, some for the Cleveland and some for others. I have heard that matter discussed over and over again by housekeepers—no reason is given for any preference, it is a matter of taste. I like the best French bread. My servants won't eat it, and I have to get them what they want, because they won't eat bread which I like. The same thing is true in regard to baking powders.

Q. In reference to the water of the alum springs, concerning which Judge Seddon has asked you, it is a matter of fact within general common knowledge that these waters are taken medicinally, is it not? A. That is a fact. They are advertised. They are advertised and used as medicinal waters. I have no experience with them whatsoever, and no knowledge except common rumor.

Q. Now with reference to the use of alum for clearing water, is it your knowledge or observation that commonly people prepare or clear in that way the water they are going to drink? A. They do not. It is simply a question of hygiene—the water supply of cities. I have no experience and no knowledge on the subject except general knowledge.

Q. Do you know, Doctor, of any instance in which people deliberately clarify with alum the water they are going to drink? A. I do not know that.

Q. Used for general purposes of baths and laundry and perhaps other household uses, but not particularly for preparing water for drinking? A. I have no knowledge or experience in that line.

Q. The effect of alum is that of a coagulent in water? A. I presume so. I have no practical knowledge of these methods.

Q. You would not therefore undertake to advise the clarification of drinking water with alum? A. Not unless I looked it up. I have not that information.

Q. As at present advised? A. As at present advised I have not enough information.

Q. You would know if the alum was soluble in the water, would you not, Doctor? A. Yes—it is soluble in one to eight parts, I think. It is soluble in water.

Q. If that water was drunk the alum would go into the stomach in that condition probably? A. Unless it formed an insoluble compound with some organic impurities and settled.

Q. The healthfulness of the water, after being clarified with alum would depend upon the neutralization of the alum in the process of clarification? A. I think so.

Q. If not the water would not be wholesome? A. Alum is used for that purpose—to clarify the water. If these unwholesome substances that exist in the water were not removed and neutralized, the water would be unwholesome.

Q. Suppose there is an excess of alum left there after neutralization of the things it may combine with? A. I should not call it then either an agreeable or good water.

Q. Would it be wholesome? A. I should think not. not.

Q. Judge Seddon asked you, on your redirect examination about the use of baking powder in your family, and asked you if you would use any other than Layton. Would you use any other as good as Layton? A. I have no objection to a reputable alum baking powder. My impression is that they are not disreputable.

By Mr. Seddon:

Q. You would take ordinary precautions to exclude

from your family any impure food, would you not? A. I would.

Adjourned to Thursday, January 4th, 1900, at 10 a. m.

Not being able to complete the taking of said depositions by reason of lack of time, I adjourn the further taking of the same until tomorrow, then to be continued at the same place and between the same hours mentioned in the annexed notice.

Howard McWilliams.

State of Missouri,
vs.
Whitney Layton.

New York, January 4, 1900.

Met pursuant to adjournment.

Present: Parties as before.

Pursuant to adjournment as above stated, on the 4th day of January, 1900, between the hours of ten o'clock in the forenoon and three o'clock in the afternoon at the Townsend Building, Broadway and Twenty-fifth street in the city of New York, I continued the taking of said depositions, as follows, to wit:

ERNEST ELLSWORTH SMITH resumes the stand for further re-cross-examination.

The Witness: I wish to qualify the statement made by me that death was never known to be produced in man by the use of alum to mean by taking alum in quantities so as to produce a chronic effect. There are very few recorded cases in which alum has in large doses produced such irritation as to be followed by death.

By Mr. Cunningham:

Q. Doctor, prior to your direct examination, and in the intervals between the giving of the different parts of your testimony here, you had had full conference with the defend-

ant's attorneys, Judge Seddon and Mr. Stoner, have you not? A. May I ask what you mean by full conference.

Q. Well, say conference and consultation? A. We have usually remained a few minutes after each session and spoken of the nature of the testimony given and the statements made.

Q. That is true since the last adjournment is it not? A. I think there were some words of conversation since the last adjournment.

Q. And that was true after your first direct examination, and before the second direct examination, was it not? A. Do you mean on the two occasions, one after the direct and one before the second direct?

Q. No, I mean between the time when you first testified and went off the stand temporarily and the time when you came back and continued your testimony, you had a conference and consultation with the defendant's counsel, did you not? A. I think we had some conversation in that interval.

By Judge Seddon:

Q. He wants to know whether you had any consultation? A. I hardly know what Major Cunningham means by consultation.

By Mr. Cunningham:

Q. I can not make the explanation any plainer, Doctor. A. We have had a conversation in which the subject that I had given testimony was brought up in the conversation.

Q. You said something on the subject and Judge Seddon said something on the subject, is that right? A. That is what would constitute conversation.

Q. Is that what happened as a fact? A. As I remember that is what happened.

Q. Doctor, you said in your re-direct-examination that compounds of alumina are found in nearly every specimen of drinking water. What is your authority for that statement? A. My authority for that statement is the fact, in the first place, that I have examined specimens of drinking water and have never found a specimen of drinking water in which alumina was not present. My authority, in the second place, is the fact that I have looked over a great

many other analyses of drinking water and that I find traces of alumina or more than traces present, regarded as present in such analyses.

Q. Invariably? A. To the degree stated in my first statement. What is my statement?

Q. "Yes, in nearly every specimen." A. Not invariably but in nearly every specimen.

Q. Have the waters which you have examined come from divers and extended sources? A. They have.

Q. Spring water? A. Yes.

Q. Well water? A. Yes.

Q. Cistern water? A. Yes; I can not recollect that I have examined a specimen of cistern water in which I determined the presence or absence of aluminium.

Q. You said also that alum is not classified as a poison in the books? A. I so stated.

Q. Is it classified as an article of food? A. It is not.

Q. Did you test, Doctor, for the presence or absence of alum or alumina compounds in the liquid removed from the stomachs of Drs. Irish and Ross? A. I did not.

Q. Why not? A. Because their absence or presence formed no part of the inquiry I was making at that time. I did not even consider the matter—had not thought of doing it. The fact had no bearing upon the question of whether the material eaten contained a compound affecting secretion of the gastric juice or its ability to perform the function of digestion, which I found to be unimpaired.

Q. In these experiments upon Dr. Ross and Dr. Irish, did you think that the introduction of the stomach tube could have stimulated the secretion of the gastric fluid which you collected there or obtained in the liquid extracted from the stomach? Is my question plain or is it involved? A. It is involved.

Q. I mean to ask whether you think it is possible that the gastric juice which you found, the secretion of it, might have been stimulated by the introduction of the tube? A. The nature of the material removed could not have been influenced in any way by the introduction of the tube, because it was removed immediately thereafter. There was no interval of time more than a mere instant—less than half a minute perhaps—between the actual introduction of the tube and the removing of the fluid.

Q. Do you not think that the introduction of the tube into the stomach of one who is unaccustomed to that treatment might produce an almost instantaneous gushing or flow of gastric juice? A. I do not. I may add that the method is one very generally used for the removing of the contents of the stomach after a test meal for the purpose of diagnosis, and if such were the case, that the secretion of the gastric juice were influenced by the passing of the tube, it certainly would be known.

Q. Not being known you assume it did not occur in these cases, is that right? A. The influence of mechanical stimulii has been observed by actually watching the secretion take place under various conditions in subjects whose mucous membrane has been exposed to view by a gastric fistula, or by an opening, the result of an accident, and also in the lower animals where the stomach has been exposed to view. So that it is a matter of common knowledge that the tube being passed, does not influence materially the composition of the fluid which is contained in the stomach.

Q. I do not mean to ask about the composition. I am speaking of the actual flow of the gastric juice. A. That matter would be determined by the flow of the gastric juice.

Q. Then do you say, Doctor, that the introduction or mechanical contact of a substance such as the tube of a stomach pump even for less than one minute, would not immediately cause a decided increase in the flow of gastric juice into the stomach? A. I do.

Q. Doctor, if the organs of digestion or assimilation or excretion are continually and repeatedly overtaxed, will they not ultimately become exhausted and their function impaired or lessened and the entire system thereby weakened? A. The answer to that question depends upon the meaning which you attach to the word overtaxed. It is the function of these various organs to remove certain substances that may be introduced into the body and that are unnecessary to be retained there—it is the function of these organs to remove such substances from the body. So long as such substances are not irritating and are not present in such large amounts as to overtax the organ, then no harmful results will follow. If such substances are poisonous, as substances which you have already mentioned, arsenic, antimony, mercury, lead—if these poisonous substances are present in sufficient amount or in small

amounts for a sufficient length of time, then the effects that you have mentioned, the overtaxing of the organs will be brought about or some other direct morbid result will follow.

Q. In your opinion does the fact that an organ successfully resists the first application of some deleterious agent brought in contact with it, lead necessarily or logically to the conclusion that that organ will successfully resist an indefinite number of applications? A. That will depend upon the nature of the application and of the subsequent condition of affairs. To explain that statement let me say, referring again to these substances which you mentioned, that substances like arsenic and mercury have what we term a cumulative action. If given in such small doses as you mentioned, in amounts, say, of one-thousandth of a grain they may produce no immediate physiological or pathological effect but if they should be given in sufficient doses and sufficiently often repeated so as to accumulate in the central organs of the body, then they are possessed of the property of inducing certain poisonous effects. They, if accumulative, would after repeated doses produce an effect which they would not produce in a single dose. In the case however of a substance like alum which in certain amounts we know to be an irritant, in this case the substance is removed from the body; or if retained in traces by absorption—which however we do not know to be the case—it is transformed into an entirely different substance, and will at no time in the future be present as alum to assist in any deleterious action.

Q. Doctor may I call your attention to the fact that I think this answer is an apology for alum and not an answer to the question I put; and I will ask you whether you can not make a more direct answer to the question which I put in the abstract?

Mr. Seddon: The counsel for the defendant also requests the witness to confine his answers as far as possible to the direct question so that we will be able to get through as quickly as possible.

Q. (Repeated as follows): In your opinion does the fact that an organ successfully resists the first application of some deleterious agent brought in contact with it, lead necessarily or logically to the conclusion that that organ will successfully resist an indefinite number of such applications?

A. It does not necessarily in every case lead to that conclusion.

Q. Do you think it does logically as a general proposition? A. The question leaves so many conditions unspecified that I think an answer to it as a general proposition would not be fair.

Q. Do I understand you to say doctor that you can not make a categorical answer to the question as put—that is yes or no. (Question repeated.) A. That is so.

Q. You mean you can not? A. I can not say yes or no.

Q. Doctor, I do not think you have stated in your examination what your age was at the time of these experiments you made on yourself? A. Thirty-two years of age.

Q. Can you state the age of Dr. Ross? A. I stated that the age of Dr. Irish was 27 or 28 years; that is about the age of Dr. Ross. Dr. Irish is older.

Q. They were both men under thirty-five years of age? A. They were both men under thirty-five years of age.

Q. Doctor, have you found that alum or its constituents are wholly and completely excreted after being ingested with food? A. I have not studied the question of the excretion of alum when ingested with the food.

Q. And, therefore, you have not found the fact which I put? A. Therefore, I have not found the fact regarding which you questioned me.

Q. Now, was aluminium in any form dissolved in the

Q. Can you state the age of Dr. Ross? A. I stated have already stated that I did not examine the gastric secretions of Dr. Irish or Dr. Ross for the presence of aluminum

Q. You mean to say, therefore, that you do not know? A. No. I do not know.

Q. Have you any reason to believe that the alumina compounds existing in bread, made of alum baking powders are wholly insoluble in the fluids of the digestive tract? A. I have reason to believe that they are not dissolved by the fluids in the digestive tract.

Q. At all? A. At all.

Q. Any of them? A. Not any of them.

Q. Doctor, is there any compound of aluminum that is soluble in lactic acid? A. Yes; I believe so.

Q. Does lactic acid occur in the gastric secretion? A. It does not.

Q. In any of the secretions of any of the organs along the digestive tract or alimentary canal? A. It does not.

Q. Never do you mean? A. It can be introduced with the food or be made from the food, but as a constituent of the secretion it never exists. It may be introduced the same as any other substance.

Q. Is it introduced in the first instance in the form of lactic acid? A. Not necessarily introduced in the form of lactic acid. It may be produced in the stomach for example by the process of fermentation taking place in the stomach.

Q. Does it not always exist in the stomach during digestion? A. It does not.

Q. Generally does? A. It does not occur normally in any part of the digestive tract during digestion. That fact I have observed by direct observation in the case of the stomach contents.

Q. Not as a product of digestion, even? A. Not as a product of digestion even.

Q. What acid does exist in the stomach? A. Hydrochloric acid.

Q. Only do you mean? A. Hydrochloric acid is the only acid formed in the stomach to carry on the digestion. If other acids, or salts of other acids, are introduced into the stomach with the food, then it is possible to have them appear in the gastric juice.

Q. In the details you gave of the examination of the contents of the stomach of Dr. Irish, you said that the total acid of the stomach contents on the 12th, the date on which Layton food had been fed, was .251 per cent, expressed as hydrochloric acid. You also said that it was determined that the amount of combined hydrochloric acid present was .143 per cent, and that the amount of free hydrochloric acid present was .072 per cent. What acid did the difference between the .251 and the 0.215 per cent represent? A. Not necessarily any acid. It might have been acid salts or it might have been some of the organic acids which I have mentioned in the answer to the question just previous that found their way into the stomach contents through the food.

Q. And the statement, Doctor, that you made that the total acid of the stomach contents was .251 per cent is not

accurate in every sense? A. It is accurate in every sense.

Q. Now, you say that the difference between the two is not necessarily an acid at all? A. I say that the difference between the total acidity and the acidity due to hydrochloric acid is not necessarily due to an acid, but may be due to an acid salt.

Q. Now, in your testimony from which I read you said that the total acid of the stomach contents was .251 per cent and that the amount of free hydrochloric acid present was .072 per cent; of what did the difference consist? A. If I made the statement as you quote I should qualify that by the statement total acidity of the stomach contents. I believe I did so state and it was taken differently by the stenographer. At least I am accustomed to so state.

Q. Is it true, Doctor, that organic acid of various kinds generally exists in the stomach contents? A. Only as introduced by the food.

Q. Well, as a matter of fact in the digestion of actual food in ordinary life is it not true? A. The food of ordinary life nearly always contains some organic acids, either free or as salts of organic acids, so it is true that they are usually introduced into the stomach contents.

Q. Now, Doctor, are you prepared to say that none of these organic acids have dissolved any of the alumina compounds? A. I am not, I made no investigations on that line.

Q. Does your knowledge enable you to answer the question, irrespective of this particular investigation? A. My knowledge does not, because I do not know how the alumina compounds exist in the bread, and, therefore, I should need to determine that point before making a direct observation.

Q. Doctor, you will please pardon me for suggesting that we are not talking about bread, or alum baking powders or any other one thing than simply this—whether or not you are prepared to say that none of the compounds of alumina are ever dissolved by any of the organic acids which you have said occur in the ordinary digestion in the human stomach? A. I beg your pardon; that is quite true. There are undoubtedly compounds of alumina that would dissolve in the organic acids mentioned.

Q. Doctor, you said in your redirect examination, "Children should not be fed bread until they are about one

year of age." Do you say that as a fact children are not sometimes fed with bread before they are a year old? A. I do not.

Q. Are you prepared to say that that is not a common practice, to feed them with bread more or less before they are a year old? A. I am not prepared to say that is not a common practice among certain classes of people.

Q. Doctor, the following question was put to you in redirect examination: "And being questioned on your cross-examination in reference to the influence of administering repeated doses of alum, through a considerable time, I understood you to state that the natural effects would produce a state of constipation. I will ask you whether or not that would not depend upon the size of the dose." To that question you answered: "It would depend entirely upon the amount of alum taken." I ask you now how much alum do you say might be taken daily without producing constipation or other disorder in the digestive tract by an ordinary person? A. I do not know.

Q. You can not fix any limit? A. I can not fix any limit.

Q. Then when you say, as you did say in your answer, that the result would depend entirely on the amount, you practically said that you did not know, or that is, as I understand you now what you meant to say? A. That is not what I meant to say.

Q. Please explain then, Doctor? A. I meant to say that as I think I have already explained in our conversation this morning, alum produces its effect in the ways we have mentioned in the question, through its influence at the time when given. It is thereupon removed from the seat of action and its influence ceases. If there is not sufficient given to produce the effects in question, then by repeating small doses or amounts, that effect will not be obtained; this of course being understood when small amounts are administered they do not produce and can not produce this action.

Q. Doctor, you said once that the effect of alum taken in some quantities or under some conditions would produce constipation, did you not? A. I did.

Q. And you have also said that whether it would not depended entirely upon the amount taken? A. Upon the amount.

Q. Now I ask you if you can give us any answer to the question as to what your idea is of the quantity and amount to be taken upon which the result would depend? A. I stated I think at the beginning of my cross-examination on the subject of alum, that I had made no experiments with alum; that I could give no answers from immediate or direct knowledge from observation. I have answered the questions from my general knowledge of the subject at your request. I, therefore, say that I have no specific knowledge.

Q. Will you answer as of your general knowledge—unless you prefer not to do so? A. I can not answer a specific question from general knowledge.

Q. You can not answer this question specifically from your general knowledge? A. I can not.

Q. While you say it depends altogether on the amount, you can not tell us anything what that amount is? A. I can not, except that it is an amount less than would be necessary to produce the effect. The amount usually given to produce the effect is ten grains or more of alum.

Q. Now do you mean from your knowledge to express the opinion that if you will give an ordinary patient nine grains of alum in his food or in his stomach, three times a day for sixty consecutive days that it will not produce any constipating effect on him. I ask, do you mean to express that opinion? A. I do not.

Q. Would you say that then of any definite amount less than nine grains? A. I would of an amount considerably less.

Q. Well, how much less, if you please? A. Well, I would say that of one grain given three times a day for sixty consecutive days.

Q. One grain three times a day for sixty days, in your opinion, would not have any effect at all upon an ordinary person? A. No effect on an ordinary person.

Q. Can you indicate from what source you derive that opinion or conclusion? A. Merely from my general knowledge.

Q. Doctor, in the experiments which you have detailed as performed upon yourself, did you test either the fecal matter or the urine for alumina? A. I did not.

Q. Why not? A. For the reason that all my investigations were undertaken at the request of the counsel and

advisors of the defendant, by whom I am retained, to determine whether in my judgment the use of food so prepared was or was not harmful, and in my judgment that question could be ascertained by observations on the scientific experiments carried on in the way in which we proceeded. I did not believe that the question needed any investigation in order to decide the matter; in fact, I was very much of the opinion that the failure to decide the matter positively one way or the other, and the controversies that had existed regarding this discussion, the prolonged controversies, are due to the fact that they have approached the question purely from this chemical point of view and not from the physiological point of view: the point of view as to the actual digestibility and availability and value of this food.

Q. To what controversies and prolonged controversies do you refer in that answer? A. To such controversies as are recorded in the literature.

Q. On what subject? A. On the subject of the influence of alum when used in the preparation of food under various conditions.

Q. Do you think it possible to determine physiological actions and effects without the use of chemical analysis? A. I do not.

Q. Do you think that the complete excretion of ingested material can otherwise be determined? A. I do not.

Q. Now, I put to you the question of a layman, namely, if you started with an alumina compound and you wanted to determine the effect upon the tissues or organs or circulation of the body of the patient of that compound, would not it have been logical and proper to determine what had become of the alumina compound you started with? A. That might be a very important thing to determine, and it might be a matter of no consequence. The question is not what becomes of the compound, but what effect it has upon the organ.

Q. Well, Doctor, in a diagnosis, the source of a disturbance might be very obscure, might it not? A. You put that as a general question?

Q. Yes. A. Yes.

Q. Do you think it would have been pertinent to this inquiry to ascertain whether or not some of the alumina compound that you started with had not been left in the system? A. I did not think so; it did not occur to me to carry on an

investigation in that line; it did not occur to me to investigate that point; it did not appear to me as bearing upon the question.

Q. In your redirect examination you said "I believe it it generally assumed that if alum is taken into the system, it is quickly thrown off. I think that is common knowledge." Are you not aware, Doctor, that that proposition has been denied by high authority? A. I have not looked carefully into the question of the authorities on the subject, but I was guided in my answer to that question by statements I have seen by good authorities, that the facts that I have stated are so.

Q. But you said, Doctor, you think that is common knowledge? A. I so think.

Q. You think that is common knowledge? A. I so stated, meaning that it is a condition of affairs generally accepted to be the facts in the case.

Q. Have you ever read or head anything of the experiments by Paul Siem, made under the direction of Hans Meyer, which showed that when alum is injected into the blood of animals, no symtoms are apparent for three or four days, but after such period loss of apetitie, obstinate constipation, emaciation, langor and disinclination to move ensue, and that these symptoms are followed by partial paralysis and insensibility to pain, that the power of moving the tongue and swallowing even the saliva is completely lost? A. I am not familiar with that work.

Q. Or with the fact or history of those experiments? A. Or with the fact or history of those experiments.

Q. Are you aware, Doctor, that the use of alum in baking powders has been condemned and declared injurious to health in published reports of the Massachusetts State Board of Health and the opinion of Dr. Edward S. Wood, analyst of food for that Board, and professor of chemistry in Harvard Medical School is to that effect? A. I am not.

Q. Are you aware that the same use of alum has been condemned and declared injurious to health in published report of the Dairy Commissioner of New Jersey and the opinion of Dr. H. B. Cornwell, professor of Chemistry in Princeton university and chemist for the State of New Jersey is to that effect? A. I have read that report.

Q. I ask you the same question with reference to the

report of the Department of Inland Revenue of Canada and the opinion of A. McGill, assistant to the chief analyst of the Dominion of Canada? A. I do not know of that article.

Q. Do you know of an article published by Dr. S. W. Johnson, professor of Theoretical and Agricultural Chemistry in Yale College and director of the Connecticut Agricultural Experimental Station at New Haven to the same effect? A. I think I have seen that statement quoted in Royal Baking Powder advertisements.

Q. Nowhere else? A. Nowhere else.

Q. Do you know of the testimony and opinion of Dr. Charles T. Chandler, at that time professor of Chemistry of Columbia university, and president of the New York Board of Health, which was given in a case in a court in the City of New York, the case of Mott v. Burns to the same effect? A. I do not.

Q. I ask you the same question with reference to a published report of the Ohio Dairy and Food Commission and the opinion of H. A. Weber, chemist of that Commission? A. I believe I have read that report.

Q. Have you read published books on the subject of alum in human food? A. I have read statements in books.

Q. Are you familiar with the treatment of that subject by Alfred Stille in his work on "Therapeutics and Materia Medica?" A. I am not familiar with his statements or his treatment of the matter.

Q. I will ask you if you are familiar with this particular statement in the article on "mineral astringents" which for convenience of reference I refer to as being on page 162 of that work—"The familiar facts of practical medicine render it—certain that when alum is taken into the stomach it is absorbed and modifies the blood and probably also the contractivity of the animal fibres. But it also is found in the urine of persons who use it and in the liver, spleen, and other organs of animals to which it has been given in large quantities." Are you familiar with that statement in that treatise? A. I am not familiar with the statement as it appears in that treatise. I am familiar with the facts as stated by other authorities.

Q. Are you familiar with the facts as stated by this authority in the quotation I have read you? A. Do you mean I have actually read it in that book?

Q. I ask you whether or not you are familiar with the facts which are here stated in the part I have quoted? A. I know the statement that the introduction of alum in the intestinal tract of animals has been found to be followed by the finding of aluminium in the liver and spleen is true.

Q. What reason have you for believing, if you do believe, —

Mr. Seddon: Before you put that question—the counsel for the defendant objects and protests against this mode of examination. It is an obvious attempt to prejudice the question by reference to assumed investigations as to which we know nothing as to the manner in which they were conducted; it is an attempt to introduce the ex parte statements of persons who are not subject to cross-examination and therefore utterly incompetent, immaterial and irrelevant. It is a subject of common knowledge that such statements may be cited with equal force on either side of this question, which it is attempted at this time to settle on a scientific basis.

Mr. Cunningham: The counsel for the plaintiff states that these questions have been put to the witness in cross-examination concerning the statement of the witness that the fact that alum taken into the system is quickly thrown off, is a matter of common knowledge. Also that until now there has been no opportunity for the plaintiff to show that such fact is not a matter of common knowledge and counsel for the plaintiff proposes and expects to produce at the trial of this cause the articles and publications concerning which he has interrogated the witness upon this particular point.

Q. Now, Doctor, I refer again to your statement in redirect examination that "It is generally assumed that if alum is taken into the system it is quickly thrown off. I think that is common knowledge." And I ask you whether you mean in using the words "common knowledge" in that answer to say that, about the fact of alum being quickly thrown off there is unanimous consensus of opinion by scientists and medical men? A. I believe that there is a unanimous consensus of opinion that following the introduction of alum into the alimentary tract, not into the blood by injection it has never been found in the system, meaning by that in the body outside of the alimentary tract. The term alum as used in many of the articles published is used by men not familiar with either the chemical or commercial use of that term and not meaning by

that term either commercial or actual alum, but meaning by that aluminum. The statements in the literature referred to I believe in every instance, where alum is spoken of as being in the system, refers to aluminum with some unknown combination.

Q. Doctor, do I understand you then to express the opinion that where alum is introduced into the stomach, there is nothing left in the system, outside of the alimentary tract or canal, that there is never left in the system any of the constituents of alum? A. I did not so state.

Q. Is that or is that not your opinion? A. That is not my opinion.

Q. Doctor, were Dr. Irish and Dr. Ross the only subjects you experimented upon in this matter? A. They were.

Q. Did you have anything to do touching this inquiry with Henry Siebert, James McGrath, Con. Bart, Thomas Leclair, Louis J. Quad, R. H. Chittenden, or one or more of these persons? A. Two of those gentlemen were subjects upon which I intended to experiment and upon whom I actually did start an experiment, but such experiments were interrupted by the beginning of the taking of this deposition.

Q. Upon which two? A. Thomas Leclair and Louis J. Quad.

Q. What was the nature of the experiment you instituted upon them? A. The nature of the experiment was an experiment similar to the experiment I have mentioned as experiment 3, which was on myself.

Q. How far had it progressed with them? A. I fed them bread, a diet similar to my own, exactly as in my own case in period 1. I collected the stools and the urine and I retained the food, the samples of food, for analysis. No analyses however were made.

Q. Were analyses made of fecal matter or urine? A. Not of fecal matter or urine or food. No analysis was made, except the analysis of a specimen of milk. I did analyse a specimen of milk. That however is not yet complete.

Mr. Cunningham: That is all.

Ernest Ellsworth Smith.

Subscribed and sworn to before me, on the day and at the place and within the hours first aforesaid.

Howard McWilliams.

DR. AUSTIN FLINT, recalled.

By Mr. Seddon:

Q. Assuming the truth of all that Dr. Smith has testified both in his original examination and further examination since you testified, state whether you have heard anything or have any facts developed in this examination of Dr. Smith which would lead you to modify the opinion that you have already given in your testimony?

Mr. Cunningham: I object to the form of the question.

Q. Dr. Flint, have you heard all the testimony that has been given by Dr. Smith in these depositions? A. I have.

Q. Now assuming that the statements as to facts of Dr. Smith to be true, is there anything in his testimony to cause you to modify the opinion that you have already expressed in this case with reference to the wholesomeness of the food prepared and cooked with such an alum baking powder as the Layton powder, as a diet for mankind? A. There is not. I have no reason to change my testimony in any way.

Austin Flint.

Subscribed and sworn to before me on the day, at the place, and within the hours first aforesaid.

Howard McWilliams.

CONRAD BART, called as a witness on behalf of the defendant, being duly sworn, testifies as follows:

Direct Examination.

By Mr. Stoner:

Q. Please state your name? A. Conrad Bart.

Q. Where do you live? A. Oak Lynn, Camden county, New Jersey.

Q. You are called Con. Bart for short? A. Yes.

Q. What is your age? A. My age is 41 years.

Q. What is your occupation? A. I have been in the employ of the Pennsylvania Salt Manufacturing Com-

pany for twenty years past.

Q. What have been your duties while in that employ? A. Principally in the manufacture of alum.

Q. Have you been continuously in that occupation for twenty years? A. Twenty years past, yes, sir.

Q. About how many hours do you average? A. Well, I have averaged—when I work shift work—we average fourteen hours at night and ten hours at day; two men constitute the twenty-four hours.

Q. Please state specifically what are your duties? A. My duties are in the alum industry, to take the alum in its raw state and prepare it for the mill. That is to prepare it, get it ready for the mill to grind it; that is my duty.

Q. You are what they call an alum burner then? A. An alum burner.

Q. And what happens to the alum in the process of burning it as under your care? A. We get the alum in its crude form as it is crystalized and we take it and we burn it. We burn it until it is simply nothing more than a hard crust; after that it goes to the miller.

Q. Are there any fumes or dust arising? A. There are fumes. All the fumes arise as the alum goes into the pan as it is evaporated—the evaporation of the alum—and then when the water is taken from the alum, then there is heavy fumes comes from it.

Q. Do you breathe these fumes? A. Well, we have to breathe it, we are right there continually in making it.

Q. What has been the condition of your health during this period of twenty years? A. Well, my health has always been a number one. I have never felt any injurious effects from alum burning, never. I have never complained. We have had a beneficial organization at the works, and I have never drawn a penny from it. I belong to some other orders and have never drawn anything from them. Certainly, I have been sick with rheumatism, but drew nothing from either of these organizations.

Q. And you have breathed the alum dust all this time? A. Yes, sir.

Q. Have you ever missed any time from your work, and if so, from what cause? A. No, sir. Never, unless I took a day off on my own account. Our company has never given us any time unless we took it off for ourselves.

Q. Never from any sickness? A. Not, a day; no, no, never.

Q. Have you ever suffered from indigestion or dyspepsia? A. Never.

Q. How many men are employed there? A. Now, then in speaking of the employment of men would you please tell me whether you mean in the whole alum department or only in the department for the manufacture of our product, that is the burnt alum.

Q. Under your immediate observation? A. Well, between twenty-five and thirty. They vary sometimes through repairs or something like that, but there is always twenty-five. Take it for the year around there is twenty-five. We do have thirty, but we shut down for repairs —

Q. To what extent do these men breathe the alum dust? A. They are continually in it—they are in it from the time they start to work at seven o'clock in the morning until they are relieved by the night man and the night man stays there until he is relieved.

Q. Is there much of this dust floating around there? A. Floating around, yes.

Q. How has your appetite been all this time? A. I can eat three hearty square meals a day and a little more occasionally.

Q. Did you ever hear of any of these other men suffering from indigestion or dyspepsia? A. No.

Q. Judging from the appearance of these men with whom you are associated, what is your observation as to their general health?

Mr. Cunningham: Objected to by the State.

A. Their health has always been good. I do not know as we have had a man laid off at all unless it was from some ordinary sickness, such as a cold or something like that. I have never known a man to lay off directly through the influence of our manufacturing duties, the goods we manufacture.

Cross Examination.

By Mr. Cunningham:

Q. A very healthy set of people these are that work there you think? A. I certainly do. The death rate is very small among us.

Q. None of the twenty-five men that you speak of ever suffered from indigestion or diarrhoea, bellyache or anything of that sort? A. Oh, well now, I don't wish to make a statement of that kind. Certainly they might, but what I say is not by the direct effects from their work. They might overload their stomach outside someway and have indigestion or something like that.

Q. You mean to say that if a fellow did have one or more spells you would know of it without being able to state the cause of it? A. No, sir; I don't wish to say that.

Q. You are not a physician? A. No, sir.

Q. You have not been in the habit of treating sick people, I suppose? A. No, sir.

Q. And you can not say anything more about it than that so far as you know, or have reason to know, these men have not been poisoned with alum—that is about the extent of your knowledge upon the subject? A. That is the extent of my knowledge.

Q. You do not claim that you have made any particular investigation or inquiry or kept any tab or account of such matters? A. No, sir.

Q. What is the condition of this raw product when it comes into your hands? A. It is in a crystal form, just a crystal, just the same as soda, salsoda, which is washing soda. It is in that condition, in crystal form.

Q. In bulk or in the barrels in which the crystals have been formed? A. No, sir. The crystals are formed in large tanks, called coolers or blocks.

Q. With the preparation of the crystal you have nothing to do? A. No, sir.

Q. How is it brought into your department? A. Well, we have it fetched in there in trucks, sometimes in wheelbarrows. We have it wheeled over there now, it is a very short distance, and we wheel all the alum in wheelbarrows now that we use.

Q. How far is it brought. I mean by that the man with a wheelbarrow brings it, how far? A. Well, I judge about what you would call about three hundred feet.

Q. How does he get it into the wheelbarrow? A. By a shovel.

Q. How does he get it out of the wheelbarrow? A. Dumps it out.

Q. Into what? A. Into a bin.

Q. Is the bin when he dumps it in ready for work, or is it a storage bin? A. Just simply a storage bin.

Q. What is the next thing that is done with it? A. The next thing that is done, we have little boxes there. We fill these boxes up. When a pan is ready we take that off and we throw this little box full of stuff into the pan.

Q. How is the box filled from the bin? A. With a shovel.

Q. How close is the bin to the pan? A. Well, some of the pans are within ten or twelve feet of the bin, and some are forty feet from the bin.

Q. When taken up from the bin and put into the box is the material in a pulverized or crystalline state? A. Any crystal that we think is too big to melt with the finer crystals we break those with a hammer.

Q. In the bin? A. Yes.

Q. Before it is put into the box? A. Before it is put into the box.

Q. Is that bin partitioned off from the place where you work? A. It is in the shape of a storage room. That is what it is constructed for, to store enough alum there to last the man over night. The day man has to get the alum there so that the night man does not run short.

Q. Is it the duty of any particular man to bring the alum from the bin to the pans? A. No, sir; the man that runs the pans he supplies the pans with the alum from the bin.

Q. He goes from the pan to the bin and brings the alum in a box to the pan? A. Yes, sir.

Q. How does he get it in the pan from the box? A. Throws it out of the box—lifts it and throws it in.

Q. Dumps it over the side of the pan? A. Throws it in clear.

Q. What is done in that pan after the alum is put in there? A. Well, sir; after the alum is dissolved, after the crystals are dissolved in the pan we go over to see that it is kept level on the pan. We have a wooden stick there. We call them blister sticks. When the alum is half burned it forms kind of blisters like and we just keep rubbing that down so that the cake becomes level, just the same as the pan. After it has become dry to such an extent that we can turn it just the

same as turning a pan cake, then we turn it over. We have an article that we call a turning iron and we take that turning iron and get under the cake and turn it over and let it burn on the other side.

Q. Without breaking the cake? A. Sometimes it will break but most of the times it will not.

Q. What are the dimensions and shape of these pans? A. I think they are 26 x 36. I am not positive.

Q. Inches you mean? A. Yes; I am not positive but I think that is the dimensions.

Q. How deep do you put the alum in them? A. We regulate that according to the heat of our pans.

Q. Well on the general average? A. Twenty-five pounds.

Q. That would make it how deep in the pan, about, I do not ask for exact inches? A. How deep in the pan?

Q. Yes. A. Well, it would make a cake about from three-quarters, well sometimes it might go a fraction over three-quarters of an inch thick and we take it off. We take it off and send it to the mill house to have it ground.

Q. Does it shrink much? A. Yes, it looses all the way from forty to fifty per cent in the burning.

Q. Is there any water to be added in with it or anything else than the crystal? A. No, sir; nothing more than the crystal alum.

Q. What heat do you apply under that pan? A. We have no regulation of heat. The heat is sometimes great and sometimes it is not. It is just according to the position we are in you know as to the fire.

Q. Have you any knowledge of what temperature the alum reaches—the highest temperature? A. I suppose about seven hundred degrees. I won't make an exact statement of that, but I think it is about seven hundred degrees.

Q. Fahrenheit? A. Yes; 700 degrees fahrenheit.

Q. Do you think that statement is accurate within any limits? A. I think that is pretty near, as near as I can get to it: I have been working over these pans now for thirteen years steady. I have not lost no time over them.

Q. Well, could you state the lowest temperature at which you have put alum out of the pan as finished? A. I would not like to make a statement in regard to that.

Q. What is the purpose of that treatment in the pan? A. The purpose of the treating of the alum in the pan?

Q. Yes. A. Simply to abstract all the water and the impurities that are in it, I suppose. That is to the best of my knowledge.

Q. How high is the roof over these pans? A. It varies. Just where I am working it is about sixteen feet from the pans to the roof. Then we have pans thirty-five feet from the pans to the roof. The building is built in an A shape, the pans setting in the wing not having the same roof space as those in the centre.

Q. How large is that apartment covered by that A shaped roof? A. I suppose the apartment we are in is about 80 by 60; then the other part of the building is used for other purposes, such as storage purposes. It has all open ventilation, etc.

Q. How is that apartment ventilated at the top? A. We have ventilators in the centre of the A peak there, and we have shutters. We regulate these shutters according to the wind.

Q. Leave them open on the leeward side? The side open to where the wind comes to carry off the fumes? A. Pretty good ventilation. We have pretty good ventilation, but it all depends on the atmosphere on the outside. Sometimes the atmosphere is heavy and the gases will not go out and they stay with us a great length of time.

Q. If the air is heavy outside, the gases will stay in? A. If it is foggy or snowing, or something like that, the gases do not go out so well; certainly in clear weather there is a great deal of difference.

Q. What is the appearance of the steam as it comes up? A. Well, in the first from when the pure crystals go into the pan it is in the form of ordinary steam arising from the pan, the same as putting a pan of water on over a hot fire, steamy evaporations; and then in about half or three quarters of an hour, after the water has evaporated, then it forms a difference.

Q. Forms a difference, in what respect? A. It starts and burns gases then, such as they use in the manufacture of crystals.

Q. Do you know what gases? A. Sulphuric acid.

Q. Now do you speak accurately when you say the sulphuric acid —

Mr. Seddon: I object to the witness stating unless he says he is an expert in this matter.

Q. Do you know the difference between sulphuric acid and sulphurous acid? A. I wish to make a statement that I think they were both one. We used what we call a purified acid there in the manufacture of crystals.

Q. We are speaking now of what gas comes off from the heated substance in the pan later than when the steam comes up? A. A gas comes off then.

Q. What is the appearance of that gas; what is the color of it? A. The gas represents sometimes, something like the smoke of the cigar, but the smell is different.

Q. You mean it is white? A. It is a sort of bluish white.

Q. Did you ever breathe that gas? A. Yes, sir.

Q. Good to breathe? A. Well, I don't know that it is good to breathe, but we breathe it, I have been breathing it a long while.

Q. It does not suffocate you or strangle you in any way? A. I suppose it would that is, somebody who had never been in there. I suppose they would say, "My gosh, this is very bay, this is obnoxious;" but I never give it a thought I have been there so long, I am accustomed to it.

Q. Did you ever get your head well over a pan where there was this bluish white smoke coming up? A. Yes, I have had occasion to go on top of the pans when there were sixteen cakes smoking.

Q. With this bluish white smoke you speak of? A. Yes, sir.

Q. Could you stand that long? A. I could stand it; I could stand the gas better than I could the heat.

Q. You never breathed it intentionally, I suppose, you never take into your lungs just for breathing it? A. For pleasure?

Q. Yes; for pleasure? A. No, sir; oh, no, we get enough without getting it intentionally.

Q. Do you know of any cases among the men of breathing troubles, troubles with their breathing, I mean troubles with the throat and lungs? A. No, sir; not to my knowledge; I have not heard anybody complain down there of that trouble.

Q. That is pretty hot when the bluish white smoke is

coming off? A. Yes, the pan is pretty hot.

Q. The smoke seems to go out and flow down the sides, or does it go up pretty straight? A. It goes right up straight after it leaves the pan.

Q. Towards the roof? A. Goes to the roof.

Q. What do you have to do with the cake after it is taken from the pan? A. Take it out of the pan and put it in a box.

Q. What box and where is it carried? A. They put about 8 cakes, as a general thing, 8 cakes means 8 pans, and put it in a box and let it cool off. The other men come and take it to the mill-house, if it is not properly cooled off, they let it cool off and grind it.

Q. When you take it out and lay it aside, you are done with it? A. Yes, sir.

Q. Is it laid down opposite the pans on the ground floor? A. No, sir.

Q. Where is it put? A. It is put in a box.

Q. Where is that box? A. That is on a four-wheeled truck.

Q. How long does it stay there before it is wheeled away? A. It stays there sometimes an hour, sometimes two hours, or fourteen hours, or twenty-two hours; it all depends.

Q. You have no purpose of having it stay there any longer than to be cooled, entirely cooled off? A. No, sir.

Mr. Cunningham: I think that is all.

Redirect Examination.

By Mr. Stoner:

Q. Mr. Bart, you don't pretend to be an expert chemist? A. No, sir; I am not.

Q. You don't know the purpose of these different steps which you have described in your cross-examination? A. No, sir; I just give to the best of my knowledge.

Mr. Cunningham: I object to the form of the questions, not in substance, they are leading.

Q. What is your appearance as to health, Mr. Bart? A. My appearance as to health, I think that I am in good sound health.

Q. What is the appearance of Messrs. McGrath, and Seibert, who are in the room here with you, as to their health? A. They never —

Q. The appearance of their health? A. Their appearance, I think is healthy looking. I would take them for healthy men, and if I were a life insurance agent, I would write a policy for them.

Q. And yet you are breathing alum dust in the course of your employment?

Mr. Cunningham: Same objection.

Q. To what extent do they breathe alum dust in their employment? A. They breathe it to that extent, from the time they come in the morning until they go home. The night man breathes it until the day man relieves him. Twenty-four hours constitute a day's work, day men ten hours and night men fourteen hours, shifting each week.

Q. Is there much alum dust there? A. Well, the alum dust is continually floating around there.

JAMES McGRATH, called for the defendant, being duly sworn, testifies as follows:

Direct Examination.

By Mr. Stoner:

Q. Please state your full name and residence? A. James McGrath; residence 708 Mountain street, Philadelphia.

Q. What is your age and occupation? I am 42 years of age; I have been packing alum for thirteen years now.

Q. For whom? A. For the Pennsylvania Salt Company.

Q. What do you mean by packing alum? A. Packing it in barrels after it is ground.

Q. Please describe fully, the nature of your employment, what you do? A. After the alum is ground in the mill, it is run down into a box, and I take it out of the box with a shovel, and pack it in a barrel, and get 350 pounds in the barrel.

Q. Has your employment been continuous for fourteen years? A. Yes, sir.

Q. How fine is it ground? A. It can be ground as fine as flour.

Q. When you shovel it, is there any dust, and how much? A. Well, there is a good bit of dust all the time. There is cloud around there all the time you are packing.

Q. You are working in this all the time? A. For about eight hours a day.

Q. What has been the condition of your health during this employment? A. First class; never had any sickness since I worked there.

Q. Have you ever suffered form any indigestion or dyspepsia? A. Nothing at all; nothing of the kind.

Q. How many are employed there with you? A. Five besides myself in that department.

Q. Have you information of any of them suffering in that way? A. Not that I know of.

Q. What has been the condition of your appetite during this period? A. I can eat three good meals every day.

Cross Examination.

By Mr. Cunningham:

Q. Have you never been sick at all in thirteen years, Mr. McGrath? A. No, sir; never had a doctor come to see me, or went to see a doctor, in all those years.

Q. Never had a bad cold? A. I have had a cold.

Q. How many of them would you say you have had in thirteen years? A. I never kept an account of them; I could not tell you.

Q. Never had anything that you ate to disagree with you at all? A. No, sir; not that I know of.

Q. You don't undertake now, to remember back over the thirteen years, everything that has happened, so that you can say you never did have anything to disagree with you, do you? A. Not that I know of, I never did.

Q. You dont now remember that you never did, is that what you mean? A. Yes, sir.

Redirect Examination.

By Mr. Stoner:

Q. Mr. McGrath, what is the appearance as to health of Mr. Bart, who has just testified? A. I have always

seen him strong and hearty, and able to do a day's work every day.

Q. And also of Mr. Seibert? A. Mr. Seibert the same. I have never seen him lose a day on account of sickness.

HENRY SEIBERT, called for the defendant, being duly sworn testified as follows:

Direct Examination.

By Mr. Stoner:

Q. Please state your full name and residence? A. Henry Seibert; 246 McClellan street, Philadelphia.

Q. What is your age? A. Forty-five years next Saturday.

Q. What is your occupation? A. Miller; I was working for the Pennsylvania Salt Works.

Q. Please describe fully your duties as miller for this salt company? A. I have been running that machinery for the last twelve years steady, right straight along from day to day, Sunday and week-day from nine to ten hours a day.

Q. What is made by that machinery? A. It grinds the alum.

Q. Does much dust arise in that grinding process? A. Yes, some days more than others, but it is there all the time, and plenty of it.

Q. Are you breathing that all day long? A. Breathing that all day long, yes.

Q. What has been the condition of your appetite during the twelve years? A. Good; I can eat three good meals a day, and sometimes four, and more yet.

Q. Have you ever suffered from indigestion or dyspepsia or anything of that sort? A. No, sir; never had anything.

Q. What would you say was the appearance as to health of Mr. Bart and Mr. McGrath, who have just testified? A. As long as I know them men, they are healthy and strong and do a good day's work, and never lost a day on account of sickness.

Q. Are you an able bodied man, capable of doing a full day's work? A. Yes, sir.

Q. Are Messrs. Bart and McGrath also able bodied men, who are capable of doing a full day's work? A. Yes, sir.

Cross Examination.

By Mr. Cunningham:

Q. Are you and Mr. McGrath and Mr. Bart, the very healthiest men about that place? A. I don't know about that. I think all the rest that works there are as healthy and strong as we are.

Q. They have always been just as healthy and strong? A. Well, always as long as I remember, and we have men working there as long as I am, and longer, and I never know them to be a day sick.

Q. Are they any healthier than you are? A. I don't know, but they are just as healthy as I am.

Q. You think it makes a man healthy to work in that place? A. It makes me healthy I know. I was working in a sugar house twelve years, but was never healthier than I am now. And I was young then, and getting older now.

Q. You are inclined to think, then, there is something beneficial about this kind of life you lead, the fumes and dust you breathe? A. I don't know about that.

Q. Well, you have been there, now what is your observation upon yourself about it? A. It keeps me in good health, that is all I know. I never got sick there.

Q. And it keeps all the others in good health so far as you see? A. It keeps all the others in good health so far as I can see.

Q. You think none of the men employed there have never been sick a day, in 10 or 12 years? A. I don't remember anyone in my works being sick, that is on account of work; he might have been sick of cold or something else, but not on account of getting sick from the alum.

Q. None of them have been sick from anything they did in that works, during the 10 or 12 years? A. No, sir.

Q. All very healthy set of men? A. All healthy set of men.

Q. Did you talk with Mr. Seibert about your testimony before you came here to testify—who told you to come here to testify. A. The boss from our works, from the Pennsylvania Salt Works.

Q. What is his name? A. Edward Bean, Superintendent.

Q. What did he tell you? A. He told me to come here for certain things, what, he did not know himself.

Q. Did you know what you were going to talk about? A. I did not, not until I was asked here.

Q. You didn't know that you were going to be asked about your health and your work down there? A. I did not know that.

Q. Did you talk with anyone after you got here to day? A. This gentleman (indicating Mr. Stoner) here was the first one I talked to when I came here to New York.

Q. Well, what did Mr. Stoner say to you? A. Well, he told me, what he said I could not just tell exactly all that word for word.

Q. No, but the substance?

Mr. Stoner: State exactly what I told you, when I spoke to you, Mr. Seibert? A. I just tell here, the way I talk; now I am a German, and I can not lay it down as flat as I ought to do, so I just have to give it the best way I can; he told me, just tell how the work is done there; what I am working and how my health is, in it, and how long I have been working in it.

Q. Did you tell him before you began to testify, how long you had been there and how your health was? A. I did.

Q. Did you hear the same pass between Mr. Stoner and Mr. McGrath and Mr. Bart, that you say passed between Mr. Stoner and yourself? A. I don't understand that.

Redirect Examination.

By Mr. Stoner:

Q. Mr. Seibert, will you please state exactly what I told you and Mr. Bart and Mr. McGrath in the hall, without answering questions put to you as to the truth? A. You told us this morning to say the truth; how old we are; how long we have been working in and how our health was.

By agreement of counsel the signature of these three witnesses, Mr. Bart, Mr. McGrath and Mr. Seibert is waived.

I, HOWARD McWILLIAMS, a notary public in and for the county of New York, in the state of New York, do certify that in pursuance of the annexed commission and notice, came before me at the Townsend Building, at Broadway and 25th street, in the city, county and state of New York, Ernest Ellsworth Smith, Austin Flint, Robert Liston Irish, Walter Howard Ross, Conrad Bart, James McGrath and Henry Seibert, who were by me severally sworn to testify the whole truth of their knowledge touching the matter in controversy, aforesaid; that they were examined and their examination reduced to writing, and subscribed by them respectively except the subscription of the last three was waived, in my presence, on the day, between the hours and at the place first aforesaid; and that their said depositions are now herewith returned.

HOWARD McWILLIAMS,
Notary Public, Kings Co.
Cert. filed in N. Y. Co.

County of New York, } ss.
State of New York, }

I, WILLIAM SOHMER, Clerk of the County of New York, and also Clerk of the Supreme Court for the said County, the same being a court of record, do hereby certify that Howard McWilliams has filed in the clerk's office of the county of New York, a certified copy of his appointment as notary public for the county of Kings with his autograph signature, and was at the time of taking the annexed deposition, duly authorized to take the same, and that I am well acquainted with the handwriting of said notary public, and verily believe that the signature to the annexed certificate is genuine.

In testimony whereof I have hereunto set my hand and affixed the seal of the said court and county, the 6th day of January, 1900.

[Seal] WM. SOHMER, Clerk.

The further hearing of the case was then laid over until the 8th day of February A. D., 1900.

On February 8th, 1900, the Court met and the hearing of the case was resumed.

ALBERT MERRELL, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seldon:

Q. Please give your full name. A. Albert Merrell.

Q. What is your age? A. Fifty-seven on the 18th of this month.

Q. Your profession? A. I am a physician.

Q. Will you kindly speak slowly and distinctly so that the stenographer can get you down all right, as it is very hard to write this kind of testimony? Are you a professional man? A. I am a practicing physician.

Q. How long have you been such? A. Twenty-five years.

Q. In the city of St. Louis? A. Yes, sir.

Q. Have you occupied any public position as a medical man? A. Twelve years a member of the State Board of Health.

Q. Of the State of Missouri? A. Of the State of Missouri, and in my second term as a member of the City Board of Health.

Q. How long in the City Board of Health? A. One full term and two years nearly on the second, six years.

Q. How long would that be? A. Nearly six years, six years in April next.

Q. You refer to the City of St. Louis? A. Yes, sir.

Q. Have you been in active practice during that period? A. Yes, sir.

Q. What has been the nature of your practice? A. I have been a general practitioner.

Q. Have you paid any attention to the subject of baking powders? A. Yes, sir; in connection with chemical work which I have carried on to a greater or less extent, analytical and consulting chemist, during the entire period I have named.

Q. In addition to being a practicing physician I understand you have a chemical laboratory? A. Yes, sir; I have

kept a personal laboratory for analytical work. Prior to my coming to St. Louis I was in manufacturing chemical work.

Q. What extent did you give to the matter of chemistry? A. How is that?

Q. To what extent have you followed chemistry as a profession? A. I have made a study of the chemistry of medicines in connection with my business and my profession during the past thirty or thirty-five years.

Q. Has your practice as a medical man been extensive during this period? A. Well, an average practice.

Q. Has it been constant? A. Yes sir.

Mr. Seddon: I wish now to put to Doctor Merrell a hypothetical question based upon the testimony of Doctor Smith of New York. I suppose the proper way to put that question would be to read it to him and to base my examination on the matter after having read it to him.

Mr. Cunningham: The Court understands that the State objects to all this evidence for the reasons stated, I will not renew it.

Mr. Seddon: That goes, of course.

Q. Assuming now, Doctor, the following state of facts to be proven, to wit: Loaves of bread are prepared by formula 1, which we will designate for certainty of reference as "Layton's Bread." In preparing this bread there were used for each loaf 585 grammes of flour of a high grade, 8 grammes of common table salt (Chloride of Sodium), 17 1-4 grammes of baking powder containing Bicarbonate of Sodium, Sodium Aluminium Sulphate, commonly known as Alum, and 500 grammes of water. The dry ingredients in this formula were mixed by sieving six times; the water was then added and the mixture transferred to the pans and placed in the oven and baked. Loaves of bread were also made from Formula No. 2, which we will call for reference "The Control Bread," the latter loaves containing the following ingredients: 585 grammes of the same flour, 8 grammes of common table salt, 3 1-2 grammes of Squibbs Sodium Bi-Carbonate (a recognized standard preparation) and 11 Cubic Centimeters of Hydrochloric Acid Solution, and of 489 grammes of water. The Bi-Carbonate was a high grade, and the Acid Solution used in

this formula was a solution of Hydrochloric Acid containing 15 1-2 per cent HCl. This bread was made by sieving the dry ingredients six times and the water which in both breads was pure spring water to which the Hydrochloric Acid Solution had been added was then stirred in the dry ingredients. The whole was then transferred to pans and baked at the same temperature as the Layton Bread, 365 degrees Fahrenheit. The Control Bread was prepared by a formula or method known as Liebig's. The crumb or inside of the loaves was used in the experiments herein detailed. This crumb of both breads was thoroughly dried, having been left for a period of 27 hours in a temperature of 38 to 40 degrees Centigrade. Then the crumb of both breads was separately broken up into small fragments and spread out in a thin layer. The dry bread was then broken up into small particles in a mortar, passed through a ten mesh sieve and a 20 mesh sieve. The particles which passed through the ten mesh sieve and did not pass through the 20 mesh sieve were taken. The samples thus obtained were composed of crumbs of uniform size. The method of carrying out the experiments consisted of mixing together in a flask 2 grammes of the bread, 380 cubic centimeters of distilled water, 50 cubic centimeters of the Pepsin solution containing two drachms of Fairchild's Pepsin in every 100 cubic centimeters of solution. The Pepsin being Fairchild's was a well recognized standard preparation. The amount of Pepsin used, therefore, corresponded to 1 gramme, and Hydrochloric Acid Solution of specific gravity 1.048, 16 cubic centimeters of the solution being added at the outset of the experiment. The above samples were placed in 500 cubic centimeter flasks and differed only as regards the particular sample of bread used. The flasks were placed in an incubator and left at 38 to 40 degrees Centigrade for 48 hours. At the end of 16 hours, 24 hours and 48 hours, 11 cubic centimeters of this same hydrochloric acid solution was added to each flask. At frequent intervals throughout the 48 hours the contents of the flasks were agitated uniformly. At the end of 48 hours the contents of the flask were made up to 500 cubic centimeters. The contents of both the filter and the residue on the filter were then filtered and an analysis was made of the amount of nitrogenous matter in solution and remaining undigested. In case of the Layton Bread 99.2 per

cent. of the nitrogenous matter presented had passed into solution, and that .8 per cent. remained undissolved or undigested. In the case of the Control Bread 99 per cent. of the nitrogenous matter had passed into solution, and one per cent. remained undissolved or undigested. This concluded the first experiment.

Two subjects, which we will designate for certainty of reference I and R, were young men between the ages of 21 and 30 in good, normal health with normal digestions. Before 9 o'clock of the morning of December 12, 1899, they had eaten nothing since their supper of the evening before. On the 12th of December at 9 o'clock in the morning they were fed a meal consisting of 60 grammes of the Layton Bread and 350 cubic centimeters of water. At the end of one hour a stomach tube was introduced into the stomach in each case and so much of the stomach contents were withdrawn as could be done with the use of that tube. The liquid portion of the stomach contents was then examined. Taking first the subject "I," it was found that the total acid of the stomach contents on the 12th was .251 per cent. expressed as hydrocloric acid. The amount of combined hydrochloric acid present was .143 per cent. The amount of free hydrochloric acid present was .072 per cent. A test for Pepsin was then carried out as follows: 5 cubic centimeters of the liquid portion of the stomach contents was placed in a tube and to this .2 of a gramme of moist albumen prepared under constant conditions was added, and the whole was placed at a temperature of 38 to 40 degrees Centigrate in an incubator occasionally agitated. It was observed in the case of subject "I" that the albumen had passed into solution at the end of an hour. On December 16, 1899, the same experiments were conducted on these same individuals under the exact state of facts, and conditions hreinbefore mentioned, except that the Control Bread was substituted in the experiment for the Layton Bread. Taking the case of the subject "I" the liquid portion of the stomach contents after eating the Control Bread on December 16, 1899, yielded the following results. Total acid expressed as hydrochloric acid, .233 per cent.; combined hydrochloric acid .136 per cent.; free hydrochloric acid, .086 per cent., and in the Pepsin Test 5 cubic centimeters dissolved 2-10 of a gramme of moist albumen when placed at 38 to 40

degrees Centigrade, had dissolved in 1 1-2 hours. The experiments on the subject "R" on the 12th of December and 16th of December, 1899, yielded the following results: The experiment and the process being identically the same as that of subject "I." The results in the case of "R" were as follows: On December 12th, when the Layton Bread was used, total acid, .220 per cent. expressed as hydrochloric acid; combined hydrochloric acid, .145 per cent; free hydrochloric acid, .070 per cent. In the pepsin test solution was complete in 1 1-2 hours. On December 16, 1899, when the Control Bread was used, the total acid, .221 per cent. expressed as hydrochloric acid; combined hydrochloric acid, .131 per cent; free hydrochloric acid, .069 per cent. In the pepsin test solution was completed in 1 1-2 hours.

Subject "S" was a man of about 32 years of age of normal health and digestion. The experiment on this subject consisted of 2 periods. Period No. 1 was a period of 3 days, November 13, 14 and 15, 1899. The crumb of four loaves of the Layton Bread was previously weighed off in 150 gramme portions, each portion was wrapped in wax paper and put away for use in the diet. This bread contained the following composition:

Moisture	52.46 per cent.
Solids	47.54 per cent.
Protein	6.50 per cent.
Fats	.22 per cent.
Ash	1.42 per cent.
Carbohydrates	39.40 per cent.

A diet was fed exclusively to the subject "S" for three days, consisting of this bread and of meat, prepared as follows: A round of beefsteak was stripped of all visible fat, and the lean portion then chopped fine. Cooked in a frying pan, salted, some of the juices pressed out and the residue distributed in jars of 50 gramme portions, each jar containing 50 grammes. The jars were then sterilized. Composition of this meat on analysis showed it to contain 50.54 per cent. of moisture, 49.46 per cent. of solids, 41.56 per cent. of protein and 5.43 per cent. of fat. The milk used in this diet contained the following: 87.66 per cent solids, 12.34, protein 3.10 per cent., sugar 4.78 per cent., fat 3.70 per

cent. The butter used in the diet contained water, 45 per cent.; solids, 89.55 per cent;. fat, 89.04 per cent.; protein, .49 per cent. The diet was arranged as follows: The breakfast of the subject on the morning of November 13th was 150 grammes of Layton Bread, 50 grammes of the aforesaid meat, 30 grammes of the aforesaid butter and water; lunch consisted of 300 grammes of the same bread, 500 grammes of the same milk; dinner consisted of 150 grammes of the same bread, 50 grammes of the same meat and 30 grammes of the same butter. On November 14th the diet for breakfast for lunch and for supper was identical with that of the 13th. On November 15th the diet was as follows, of the same materials as above stated, to-wit: Breakfast, 150 grammes of bread, 50 grammes of meat, 15 grammes of butter, lunch 300 grammes of bread, 500 grammes of milk; dinner 150 grammes of bread, 50 grammes of meat and 15 grammes of butter, making a total amount of food consumed during this period of three days, 1,800 grammes of bread, 300 grammes of meat, 1,500 grammes of milk and 150 grammes of butter. The nutrients contained in this diet were:

	Solids.	Protein.	Fat.	Carbohydrates.
Bread	835.7	117.0	3.96	709.2
Meat	148.38	124.68	16.29	
Milk	185.1	46.5	55.5	71.7
Butter	134.325	0.735	132.06	
Total	1,323.505	288.915	207.81	780.9

On the evening of November 12th, at the close of the customary meal, the subject "S" took 6 grains of lamp black. Before the breakfast of November 16th about half an hour previous thereto he took 12 grains of lamp black. The movement of the bowels of the subject occurred daily during the period, and on the 14th the last portion of the dark stools with which the first lamp black appeared were separated from the fecal matter that came at the end of emptying the bowels and only the second portion passed which was light green as compared with the dark blackish portion of the first portion so reserved. On the 15th all of the movement was preserved,

and on the 16th a considerable amount of lamp black appeared. This was all included with the specimen of the feces collected at this time as representing the excreta contained during this period. This fecal matter was moistened with hydrochloric acid and dried to a condition called air dried, and was found to be 59.1 grammes in weight. This material contained following ingredients:

Moisture	8.62 per cent.
Solids	91.38 per cent.
Protein	44.62 per cent.
Fat	18.91 per cent.
Carbohydrates material	25.83 per cent.

in the residue. Thus the total constituent of the fecal matter was 54.006 per cent.; protein, 26.37 per cent.; fat, 11.176 per cent.; carbohydrate, 15.265 per cent., all in grammes. Comparing this with the amount of nutrients eaten, the amount of the material appearing in the feces was as follows this being percentage of the food eaten:

Solids	4.08 per cent.
Protein	9.01 per cent.
Fat	5.37 per cent.
Carbohydrate	1.95 per cent.

Leaving a percentage of diet appropriated by the system during the period of three days:

Solids	95.09 per cent.
Protein	90.09 per cent.
Fat	94.63 per cent.
Carbohydrate	98.05 per cent.

During this period the urine was collected. The bladder was emptied at 7:30 o'clock a. m. of November 13th and all material passed from the bladder up to and including November 16th at 7:30 o'clock a. m. was retained in the specimen. The volume of the urine was 3,500 cubic centimeters. The specific gravity was 1,023; the amount of nitrogenous matter was 1.348 grammes in each 100 cubic centimeters, being a total for the entire amount of 47.18 grammes. There was a moderate amount of indican present. The sulphates in

combination with organic matter known as ethereal of combined sulphates were found in 100 cubic centimeters to be .0159 grammes, and the total amount was .556 grammes.

Period No. 2 covered three days Nov. 20th, 21st and 22nd, on which the subject "S" partook of his diet the same as used by him in the period 1, before referred to, differing only by substituting for the bread of that diet the aforesaid Control Bread, and in substituting milk secured from the same source as milk used in period 1. This milk was sampled as in period 1, as in previous days, and contained the following nutrients:

Water	86.37 per cent.
Solids	13.63 per cent.
Protein	3.13 per cent.
Sugar	4.76 per cent.
Fat	5.03 per cent.

The material eaten during this period consisted of bread crumbs of the Control Loaves chopped and weighed off in 150 gramme portions before the beginning of the experiment, each portion having been wrapped in wax paper and kept exactly as had been done with the Layton Bread in period 1. This bread was composed as follows:

Moisture	50.26 per cent.
Solids	49.74 per cent.
Protein	6.81 per cent.
Fat	.24 per cent.
Carbohydrate	41.30 per cent.

The meat was the same sterilized meat as was used in period 1. The exclusive diet eaten by the subject S. starting on November 20th consisted of breakfast: 150 grammes of bread, 50 grammes of the meat, 30 grammes of the butter; the lunch consisted of 300 grammes of bread and 500 grammes of the milk. The dinner consisted of 150 grammes of the bread, 50 grammes of the meat, 15 grammes of the butter. The diet on the 21st was the same as that on the 20th. On the 22nd the diet consisted of 150 grammes of bread, 50 grammes of meat and 15 grammes of butter for breakfast; for lunch 300 grammes of bread and 500 grammes of milk;

dinner 150 grammes of bread, 50 grammes of meat and 15 grammes of butter, making a total amount of food eaten within the three days, 1,800 grammes of bread, 300 grammes of meat, 1,500 grammes of milk and 150 grammes of butter. The total nutrients in grammes contained in this diet were as follows:

	Solids.	Protein.	Fat.	Carbohydrates.
Bread	895.32	122.58	4.32	743.04
Meat	148.38	124.68	16.29	
Milk	204.45	46.95	75.45	71.4
Butter	134.325	0.735	132.06	
Total	1,382.475	294.945	228.12	814.8

The solids of the bread in this period constituted 64.7 of the total solids of the diet for the whole period. The excreta of this period was separated exactly in the same manner as in period 1. The feces were treated in the same manner as in period 1 and yielded 68.3 grammes of air dry material. The composition of the material was as follows:

Moisture	16.92 per cent.
Solids	83.08 per cent.
Fat	18.69 per cent.
Protein	43.63 per cent.
Residue	19.40 per cent.

The total amount of the various constituents were as follows:

Solids	56.744 grammes.
Protein	29.799 grammes.
Fat	12.77 grammes.
Carbohydrates	13.25 grammes.

The percentage of material appearing in the feces as compared with the fat was:

Solids	4.1
Protein	10.1
Fat	5.6
Carbohydrates	1.6

The percentage of the diet available was:

Solids	95.9
Protein	89.9
Fat	94.4
Carbohydrates	98.4

The urine was collected during that period from November 20th at 7:30 o'clock a. m., when the bladder was emptied, to and including the emptying of the bladder of November 23rd at 7:30 a. m. The volume of the urine thus collected was 3,250 cubic centimeters. The specific gravity was 1,024.5. The nitrogen was 1.436 grammes in 100 cubic centimeters. The total specimen containing, therefore, 46.67 grammes of nitrogen. The indican was present in a moderate amount. The combined sulphate expressed as sulphuric acid was .01624 grammes in 100 cubic centimeters. The total amount during the period contained in the specimen was .528 grammes.

Assuming that the aforesaid facts have been established, state whether you can draw any inference in reference to the wholesomeness of the aforesaid Layton Bread for consumption in the human diet as bread is used in such diet, and if so, state to what conclusion in reference thereto you arrive.

I have read you the hypothetical case. I will ask you whether you have familiarity with this hypothetical case other than you have learned from my reading it at this time? A. This particular case?

Q. This hypothetical case? A. I read the transcript of Dr. Smith's testimony.

Q. Have you read that which I read to you? A. I recognize that as substantially identical with that in Dr. Smith's testimony as I read it.

Q. Don't you know that this is the paper I gave you to read? A. Yes, sir.

Q. Have you given the matter any consideration and thought? A. I read it carefully with a view of satisfying my own mind as to the accuracy of the process for the purpose intended as near as I could judge.

Q. The reason I ask you is because the statement is rather a complicated one. I ask you if you understand the statement? A. I think I do. My knowledge of physiological

chemistry is not experimental, it is based on other people's results. I am familiar with results reached and the methods used in reaching the results, but have not had the laboratory experience in that direction.

Q. Now, assuming the hypothetical case to be true, are you able to express any opinion on the question whether or not bread prepared and cooked with that Layton food is a healthy or unhealthy bread? A. That particular Layton food powder?

Q. I am assuming that the hypothetical case that I read to you is true in every fact that it states and ask you whether you are able to state whether or not bread cooked with that same powder, the Layton powder, is a healthy or unhealthy bread? A. If you mean by the term healthy not prejudicial to health, and by unhealthy prejudicial to health—

Q. I mean to say whether wholesome or unwholesome as a diet to be used by man in his daily food? A. I think the term wholesome is used in a wrong connection often. I do not think the presence of baking powder, if it is a suitable baking powder, contributes to or takes from the food in which it is used. I would not say that it was wholesome bread. The influence of it is negative. There is no influence whatever and therefore food in which it is used would not be impaired as a food by its presence.

By the Court: Does that expression of yours in reference to the presence of baking powder in foods relate to all cases of baking powder, or is it confined to the one kind of the so-called alum baking powder? A. I think no baking powder contributes anything to the food in which it is used, that its purpose is not to add to the food value except indirectly by making it light and digestible by reason of its porosity.

Q. Your idea of baking powder is that it is a substance which produces mechanical effects? A. Produces mechanical effects, makes it more digestible than it would be without being light.

Q. Is that true of all classes of baking powder? A. Yes, sir; that is true of all classes of baking powder. I would state that there are claims made with reference to phosphatic baking powders that they do contribute to the value of the food ,but that is a question which is not settled.

Q. That acid is phosphatic? A. The acid phosphate

of calcium is the acid constituent or one of the acid constituents.

By Mr. Seddon: Are you familiar with the composition of baking powders that are sold in the trade? A. Yes, sir; I have had experience which gave me considerable familiarity with them up to within two or three years.

Q. What is the composition of what are known as alum baking powders? A. Anhydrous or dry sodium aluminum, potash aluminum or ammonia aluminum, bi-carbonate of soda and starch.

Q. Do you know what the formula is by which they are manufactured as a rule? A. Only approximately. I have made a great many analyses of that class of baking powders, but I do not know any particular person's formula.

Q. What have you discovered to be the proper formula for baking powders? A. In general 20 per cent. of alum, about the same amount of bi-carbonate of soda, and starch enough to make 100 per cent.

Q. When these materials are mixed together in baking powder and mixed with flour and water making dough what, if any, chemical reaction takes place? A. You are speaking of the mixture of alum, soda and starch in the so-called alum powders?

Q. Yes. A. The re-action results in the production of sulphate of sodium and hydrate of aluminum or aluminum hydroxide and the production of carbonic acid gas, the escape of the latter being the means by which the bread is made spongy and porous or light, as we ordinarily express it.

Q. Well, assuming bread to be prepared with such baking powder as you describe, what effect will it have on the bread with reference to its wholesomeness or its unwholesomeness as a diet for mankind? A. I have never been able to satisfy myself that there is any reason to believe that it is in any degree impaired; that its influence is as I stated a while ago, nil. The porosity makes it more digestible than it would be if not porous.

Q. Bread without any leaven would be flat and indigestible? A. It would be so compact that it would be impossible for the digestive juices to penetrate it and act upon it.

Q. I will read to you another hypothetical case, which I am glad to say is a very short one, from the testimony of

Dr. Keiser. Assuming that a 14 ounce avoirdupois loaf of white bread if cooked with what is known as a straight alum powder contains 10.17 grains of aluminum hydrate and 9.9 grains of sodium sulphate, and if cooked with what is known as a phosphate alum powder contains sodium sulphate .46 of one per cent. of the loaf, and of aluminum phosphate .13 of one per cent. of the loaf, and of calcium phosphate .8 of one per cent. of the loaf, what effect, if any, in your opinion would the presence of those elements in the cooked bread have upon the digestion or health of one using the bread at his meals for his regular daily diet? A. In my opinion they would have no effect.

Q. Is aluminum hydrate classed in medical books as a medicinal agent of any kind? A. Aluminum hydrate?

Q. Yes. A. Aluminum hydrate is not used medicinally outside of the homeopathic school. They use it.

Q. In your practice have you ever noticed or have you ever had your attention called to any case where the digestion or health of any person has been injuriously affected by the eating at his meals of bread cooked with alum baking powder? A. I have never seen an instance that I could trace to any such cause.

Q. Has your experience in that direction been large by reason of your connection with boards of health? A. Not by reason of my connection with boards of health, but as large as the average practitioner for the number of years of my experience. Public health work does not bring me in personal contact with a patient or enable me to have any observation on that particular point.

Q. Do you know of any reliable or standard medical work in which is condemned the practice of eating food cooked with alum baking powder? A. I do not recall any such work. I do not remember of having seen any such statement in any standard medical work.

Cross Examination.

By Mr. Cunningham:

Q. In your answer to the first hypothetical question predicated upon the tests and results of Dr. Smith, do you predicate the opinion that you express upon the accuracy of

Dr. Smith's conclusion? A. No, my answer was based upon the assumed accuracy of his methods, I mean of his results chemically speaking.

Q. You mean of the facts which you determined by his chemical work? A. Yes, sir.

Q. You do not then predicate the opinion that you express at all upon the conclusions of Dr. Smith further than the facts he ascertained? A. No, sir.

Q. Can you tell how much alum Dr. Smith started with? Do you find in the hypothetical question put to you or in the testimony of Dr. Smith, any statement or information as to how much alum he started with? A. Only the general statement that he used so much of the powder. From my general knowledge of such powders and the fact that has been presented here as a matter of testimony that the particular powder had a certain composition, and assuming the statement as to its composition to be correct and his statement as to the amount he used to be correct, I could estimate the amount of alum in the food he gave to the subjects on which he experimented.

Q. How much was it? A. I cannot estimate it offhand, I should have to have the figures and sit down to it.

Q. Would your opinion depend at all upon the accuracy of that assumption on your part, I mean the assumption that he did start with a definite quantity of alum? A. My opinion you mean as to its digestibility or value as food?

Q. Yes. A. Within certain limits it would. Of course, I can conceive of a condition in which the bread might be made and loaded with an enormous and unreasonable amount of baking powder, and my opinion with reference to that bread would be adverse, but assuming the amount of baking powder is the usual amount used for the purpose of securing lightness of bread, a variation of a grain or a fraction of a grain, or of several grains would not change my opinion.

Q. As a usual fact who is it that determines the amount of baking powder that should go into a loaf of bread? A. The manufacturer thinks he determines it, but he does not, the cook determines it as a rule.

Q. Can you say whether in your observation or opinion cooks determine it with apothecaries' scales or by any exact mode of measurement? A. Not with the exactness of apothecaries' or others' scales. There is an approximation, how-

ever, which is prescribed by the manufacturer which is approximately accurate. When I say approximately accurate I mean sufficiently so to be within the limits of the customary use of baking powder. The average of a teaspoonful of baking powder, for instance, or for a number of teaspoonfuls measured out would be close to each other, sufficiently close as not to make any material difference in the digestibility of the resulting bread, and sufficiently close not to introduce an unreasonable amount of powder into the bread. That is the object of bulking the powder.

Q. Suppose that two teaspoonfuls does not have the effect of making the bread light, would the cook be likely to put in three the next time? A. If she did she would not repeat it the next time after that.

Q. Why not? A. Because her bread would be discolored and objectionable in appearance and taste, and she probably would be prevented from using it any more.

Q. What would color it? A. The soda, assuming the soda is in excess it would color it. If the soda were not in excess the bitterness produced by the sulphate of soda would be sensibly appreciated.

Q. The cook would not know whether it was bitter? A. But the party to whom she gave it to eat would know it.

Q. They would come back on the cook and you think that would check that use of an excess of baking powder? A. Yes, to an excessive extent it would.

Q. Do you know of any other check? A. Any other check as to excessive use?

Q. Any other check on the cook? A. I do not know, a cook is an unknown quantity.

Q. Suppose that the components of the baking powder were not properly adjusted what would happen? A. In what direction, meaning the character of the adjustment?

Q. In the practical use of it; what would be the result upon the health or wholesomeness or the proper use in the food of the baking powder if the component parts of the alum and the carbonate of soda were not properly adjusted? A. I do not think there would be any adverse influence on the health, but there would be on the unpalatable condition and unsightly appearance possibly, but I do not think there would be variation enough continued for any length of time to jeopardize health by its use.

Q. You have stated that in ordinary alum baking powder you would have 20 per cent. of alum and 20 per cent. of bi-carbonate of soda? A. Yes, sir.

Q. Suppose, as a matter of fact, you had 35 per cent. of alum and 15 per cent of bi-carbonate of soda? A. What then? What would be the influence on health?

Q. That is what I am asking you, what would be the up-shot of your putting it in bread and eating it? A. It would make unpalatable bread, unsightly bread, bread that people would not repeat the eating of.

Q. Don't you think it would be unwholesome bread? A. I do not know; for the reason just stated, its use would not be continued.

Q. Suppose it would be continued? A. I do not think it would be unwholesome.

Q. That would carry into the stomach, I suppose, I ask you if it would not, a lot of unneutralized alum? A. Certainly.

Q. You say that you do not think that would be unwholesome or harmful? A. If it staid there it would.

Q. How would you depend on its being gotten away? A. Because of the peristalic movement of the stomach and the effect of the juices on it unless transfused through the stomach into the circulation, which I do not think has been proved.

Q. Do you think the negative has been proven? A. I think the question is undetermined.

Q. Then it is possible for aught you know that it might be taken into the circulation? A. If injected into the circulation it would be there.

Q. I didn't ask you that. A. Not as alum, I do not think it is possible.

Q. You think it to get into the circulation as alum? A. Yes, sir.

Q. If it went into the circulation by absorption from the stomach how would it go in if not as alum? A. If it went in that way I can not tell you because I say the question is undetermined.

Q. Why do you say that it would not go in as alum? A. For chemical reasons.

Q. What are they? A. The alkalinity of the blood would precipitate the aluminum hydrate before any admix-

ture with the blood would be possible.

Q. And leave you what in the blood after the precipitation? A. Sulphate of sodium in the blood, just as a sulphate is absorbed from the stomach.

Q. Would that reduce the alkalinity of the blood? A. Transiently only, not materially.

Q. What would restore the alkalinity? A. Alkalies are taken up from food in various ways, various foods furnish alkalies and they enter into the circulation. I would like to add that I do not think the transfer of sulphate of soda into the blood would alter its alkalinity whatever. It is a neutral salt.

Q. Sulphate of soda? A. Yes, sir.

Q. But you started with sulphate of aluminum? A. Yes, sir.

Q. You have got it precipitated now and you have some sulphuric acid? A. No, sir.

Q. What is left when the hydroxide is precipitated, as you say? A. Sulphate of sodium.

Q. Is that more acid than it was before the sulphuric acid was taken from the aluminum? A. The sulphate of sodium is not an acid; it is a neutral salt.

Q. The sulphate of aluminum has two constituents, sulphuric acid and oxide of aluminum? A. Yes, sir.

Q. You have the aluminum precipitated in the blood? A. I didn't say precipitated in the blood.

Q. What did you say was precipitated? A. I said precipitated in the stomach.

Q. We have passed the stomach? A. Precipitated in the skirting surface of the stomach.

Q. I thought we had passed that point, I thought we had got the alum into the circulation? A. I announced distinctly that I did not think it was possible to get it into the circulation by transfer from the stomach.

Q. Do you mean that for any form of aluminum compound at all? A. I mean for alum.

Q. By which you mean— A. The double sulphate of aluminum and ammonium, the double sulphate of aluminum and potassium, and the double sulphate of aluminum and sodium; all three are alums.

Q. You do not think it is possible to get any form of that into the circulation from the stomach by absorption?

A. Not any alum into the circulation through the stomach.

Q. Do you say that about any aluminum compound? A. I say it for alum only.

Q. Then if aluminum get into the circulation in some other form than the form of alum what you have said does not apply, does it? A. If it was combined in a form that made it possible to enter the circulation—I am assuming that such a thing is possible, then what I have said about the precipitation of aluminum would not hold good.

Q. What would come from the compound of aluminum after it got into the circulation in that way? A. I do not know.

Q. You are not prepared then, to say that it might not do mischief, are you? A. I have no reason to believe that it would do mischief.

Q. Have you any reason to believe that it would not? A. In the first place I have no reason to believe that it enters there.

Q. We are passed that. Let us assume that it is possible and you are not responsible for this; now, I ask you if you are prepared having gotten into the blood some soluble product of aluminum, to say that it would not do any mischief or hurt? A. That I cannot answer because I do not know, nor do I think that any one else does.

Q. You do not mean to say that you do not think any one else knows more about it than you do? A. No, simply that it is a question that is undetermined.

Q. It is a matter of dispute? A. It is a matter of speculation thus far.

Q. Did not in each case Dr. Smith make but one experiment? A. With each subject, yes, sir.

Q. Now, in view of other prevailing opinions regarding this matter of the use of alum in human food, do you consider the single experiment made by Dr. Smith as sufficient to establish a reliable conclusion? A. As regards his subjects, yes.

Q. You do not think that it would throw any more light on it having conducted a number of such experiments? A. It would have extended the observation to a number of other subjects and given results as regards other subjects.

Q. Are you in the habit of making one single experiment to determine a vexed or disputed question and relying on

one experiment as conclusively settling the question? A. He has two experiments, that is experiments on two subjects.

Q. I will ask you to answer my question? A. Will you be kind enough to repeat it?

(Question read). A. No, sir.

Q. Why, then, do you say you think it sufficient for Dr. Smith to have drawn his conclusions from one experiment? A. Because in the hypothetical question the presumption was that his results were correct.

Q. And do you think that the results obtained from one experiment are to be relied upon as a basis for a general conclusion, upon a matter disputed as this one is? A. It depends on what you mean by "one experiment." Now he made several analyses, and it is a habit of chemists in making analyses to check their results as they go along, by repeating their steps in every instance where there is a doubt, any reason to doubt; now if he took the usual precautions in conducting his experiments, that it, his analyses, and the results were figured out correctly, I mean that his conclusions were correct as based on the quantities found, then I think we are justified in assuming that the general result is correct. As regarding these particular subjects, my opinion is, that the use of the bread made by the Layton Powder had no influence adversely whatever.

Q. Your opinion on that particular subject? A. On that particular subject; I do not say anything further than that. Understand me, an opinion based on a given state of facts is one thing; and an opinion based on general knowledge of a subject may be an entirely different thing.

Q. Do you think it is safe to conclude that the result of such an experiment upon one individual, is an infallible or safe guide as to what might be the results of a like experiment upon some other individual, of a different constitution or physical habit? A. No, I do not think we can draw a general conclusion for everybody by a single experiment; we can draw conclusions only as regards the subject of the experiment.

Q. Then, for general purposes, it would follow that this conclusion made upon one experiment is insufficient, wouldn't it? A. Taken by itself it would be; taken in connection with other experiments I think it is very valuable.

Q. What other experiences do you refer to? A. I refer

to the largely extended experience of the use of the material without adverse results that have ever been authenticated, this simply serves as a confirmation of the view taken that its general use has not in any degree injured anyone's health, or jeopardized anyone's life.

Q. Who takes that view? A. Those who advocate the use of those powders.

Q. Who are those persons? I speak now of authority. A. I do not understand your last expression.

Q. Make that authorities and repeat the question. A. I would like to have your definition of what constitutes authorities, before I answer that question.

Q. A person of known scientific skill, and writers in scientific books, and scientists who have made experiments on that subject. A. There is a division of opinion among men who, perhaps, are entitled to credit for scientific attainments on the question of the injurious influence of the constituents of this particular kind of baking powder, and there is an equal division of opinion with reference to other kinds. Now, then, of course a favorable opinion is not universal among men who are not commercially engaged in the manufacture of the article. Those who are commercially interested in the article naturally all favor it and believe in it, but those opposed to it believe that the ones they make are the correct ones.

Q. Now, Doctor, will you please state what authorities there are who hold that this use of alum in food in any form is safe and healthful? A. The subject of the use of alum in the form of food is scarcely touched upon in standard works on medicine and chemistry, that is simply referred to.

Q. Can you point us to one such authority that states such use to be healthful or harmless? A. I cannot because I know of no such authority; I know of no authorities that touch upon the subject at all.

Q. What are the physiological and therapeutic properties of alum? A. Therapeutically alum is classed as an astringent, but like all astringents, it has two kinds of action which are apparently opposite to each other. Stille in his National Dispensatory says it has a primary and a secondary action. Its primary action is an astringent action, that is to say, it limits the blood supply to the part with which it is brought in contact, limits it transiently and temporarily and it is followed by a re-active or secondary action which carries

with it increase of blood supply to the part instead of a decrease, and recognition of these two qualities is necessary in order to explain the double kind of action which alum seems to manifest in varied doses. In minute doses it has, as I stated, a transient astringent action, but in large doses, if it does not produce emesis that is vomiting, it will produce a cathartic action, causing loose stools and loose movements in the bowels, the very opposite of the astringent action.

Q. But in every case it seems to exercise a disturbing influence on the normal function of the organ? A. Not of the function of the organ necessarily; it disturbs in the sense of limiting, transiently and temporarily the blood supply at the point of contact.

Q. Would not you call that an influence on the organ? A. No, sir.

Q. Then when you come to the secondary effect, what do you say about that? A. If the dose is large enough to produce a secondary effect, it is its own antidote, its influence is by itself limited because it is thrown off one way or the other.

Q. If it produces purging, for instance? A. If taken in quantities sufficient to produce purging it is thrown off that way, and if taken in quantities to produce vomiting, it is thrown off that way.

Q. And you would not call the influence that produces purging or vomiting, any disturbance of the normal function of the organ? A. Not of the organ no—. Well, that is a disturbance of the normal function, a transient disturbance of the normal function. Yes, if you will, it is not a normal thing to have purging going on, or a normal thing to have vomiting going on. I did not catch the weight of your—

Q. Suppose that is frequently repeated, what do you think is the effect on the organism? A. It would depend on how frequent it was and in what doses it was given, and the condition of the individual at the time it was tried.

Q. Altogether? A. Yes sir.

Q. Suppose it happened three times a day? A. It would make no material difference, I have given it more than three times a day.

Q. Do you think it would not do any harm to give a man something three times a day that would vomit him? A. That depends on the article; I have seen men down town that

would vomit more than three times a day for special reasons.

Q. Now, Doctor— A. I mean that the vomiting can be repeated more than three times a day without producing any injurious effect on the constitution.

Q. Every day? A. Yes sir.

Q. Day after day, week after week and month after month? A. I did not say that.

Q. I asked you if you meant to say that? A. No, that would not do, because nutrition would be arrested, food would not remain on the stomach long enough to nourish the body.

Q. As a matter of fact any such thing would do a man harm? A. It would.

Q. Returning to the purging, I will ask you if you say it would be possible to give a man, day after day, week after week, year after year, and every day something which would purge him, and that that could be safe and healthful? A. No sir, not if you gave it to him to the extent of purging. I would not.

Q. Then smaller quantities which do not produce vomiting and do not produce purging would have an effect of less intensity, I suppose, wouldn't they, but of the same general nature on the organ? A. Not of the same general nature in the beginning, exactly the opposite thing to the extent that it acted at all.

Q. To the extent that it acts at all, it deranges or disturbs the function of the organ? A. You are referring now to alum?

Q. Yes? A. To the extent that it acts at all it transiently disturbs the functions of the surface with which it is brought in contact.

Q. And the amount of that disturbance and the amount of the injury depends upon the quantity? A. Yes sir.

By the Court: Q. Does it necessarily injuriously disturb the functions? A. No, sir; that is another matter; it does not injuriously disturb the function—it disturbs it; it does not necessarily injuriously disturb it. Perfectly harmless food under certain conditions disturbs the function of the organ.

By Mr. Cunningham:

Q. Suppose it is continuously brought there in contact with the organ, and continuously disturbs it, by which I mean it does so, day after day, three times a day, every day, for every week, for every month and for every year; do you say that any such disturbance even if minimized is necessarily and certainly harmless? A. I could not say anything about it, because I could not determine without an experimental observation for that length of time, and under the conditions named.

Q. Then for aught you know it may be so, that that would produce trouble, you cannot say positively that you know it has not occurred? A. No, I cannot say positively that I know it would not, I can state my opinion simply based upon the use of the article, its recognized properties.

Q. It is not anywhere recognized as an article of food, you have stated your own opinion that it cannot do any good in the stomach, have you not? A. It does not contribute to food value, no, sir, that I have already stated.

Q. Do you know of any good it can do in the stomach? A. Indirectly, yes. You mean the alum of baking powder products?

Q. The alum. A. No, sir.

Q. Do you know of any good that the hydroxide, or hydrated oxide of aluminum can do in the stomach? A. No, sir.

Q. Or in the bowels? A. No, sir.

Q. Or anywhere in the alimentary tract? A. No, sir; no good that I know it can do.

Q. You think, however, the evils that it may do are uncertain, not ascertained? A. As far as our knowledge extends they are uncertain, but I admit the possibility that our knowledge may not be infallible.

Q. What do you understand became of the aluminum hydroxide resulting from the baking powder that Dr. Smith used? A. What do I understand became of it?

Q. Yes, sir. A. After it had entered the stomach?

Q. Yes, sir. A. Probably transiently and temporarily entered into solution and subsequently became precipitated and passed out with the fecal matter.

Q. What do you think it was first absorbed with? A. That is brought into solution through the acids of the stomach.

Q. What acid? A. Hydrochloric acid, and transiently lactic acid during the changes entering into carbonaceous food.

Q. Any other, an organic acid? A. Possibly, organic acid may be present, or with it, but chiefly hydrochloric acid which is a normal constituent of gastric juice.

Q. Possibly acetic acid? A. Rarely, under rare conditions, perhaps, but it would make no difference——

Q. Now, then, first taking up with hydrochloric acid, or lactic acid, next you say there is a precipitation; where and how will that precipitation open? A. As soon as the food leaves the lower portion of the stomach it passes into the duodenum, the secretions that enter in the duodenum and the remaining portion of the alimentary canal are alkaline which alkalinity will result in a neutralization of the acid, which brings the alumina into the solution and there is a re-precipitation of that alumina.

Q. Isn't that aluminum hydrate soluble in any alkaline solution? A. It is soluble in a strong caustic alkali, not in a carbonate alkali solution, so that if that solution is as strong as there stated——

By the Court:

Q. Is it soluble in any such alkaline solution as is contained in the secretions you mentioned? A. No, sir.

By Mr. Cunningham:

Q. Isn't it generally understood by chemists to be true that a weak alkaline solution will not precipitate the aluminum hydroxide when it is in organic combination, that is a combination with organic matter? A. A weak solution?

Q. Yes, sir. A. You mean one that is in solution with an organic acid?

Q. Yes, or in the presence, say, of sugar or other organic matter of that sort? A. An acid like that is claimed to be held in solution when the aluminum hydrate is in combination with an organic acid.

Q. Then you couldn't get it all precipitated in such a case, that is you don't know that you would? A. We would, judging from recorded physiological experiments, I never repeated them myself, but judging from recorded physiological experiments we would get substantially all of the aluminum hydrate that entered the stomach originally.

Q. Are you stating that as a mere inference, or are you

stating it as a fact? A. Simply from an inference from my reading.

Q. Do you say that the authorities on that subject are certain and undisputed? A. No, I won't say so because I never saw an authority that was not disputed.

Q. Do you say that there is a uniform consensus of opinion or agreement of chemists or scientists upon that proposition? A. No, sir; you say "that proposition," let me understand what you mean by "that proposition;" do you mean the proposition that a minute amount of aluminum hydroxide will be held in solution by organic acids in the presence of an alkali?

Q. Not by any manner of means; I am trying to get at the proposition that it is not going to be precipitated. A. I say held in solution.

Q. Well, yes, then. A. I don't think there is any consensus of opinion on the subject.

Q. Why is it that you draw the conclusion that you are going to have a precipitation of substantially all the aluminum hydroxide? A. Because, as I stated, aluminum hydroxide and aluminum phosphates are frequently a product of the result of fecal matter, and it is a fair presumption that they exist in that fecal matter in a form that does not enable them to pass into the circulation, or they would not be there.

Q. Did you find that Dr. Smith discovered any alumina at all in the fecal matter? A. I don't understand that he made any test to find it out.

Q. Did you understand that he found it? A. No, sir.

Q. His experiment leaves that matter entirely undetermined? A. His experiment did not seek to determine that matter—leaves it undetermined, yes, sir.

Q. As far as Dr. Smith's experiments go no light is thrown upon the question as to what became of the alumina that he started with? A. So far as that is concerned no light is thrown on that question.

Q. But you are, as I understand you, assuming that that alumina was precipitated somewhere in the alimentary tract, and passed out with the feces without doing any mischief or harm? A. I say if they could not be observed, which I claim to be the case, in the stomach, that when it reached the alkaline portion of the alimentary tract that is

below the stomach, that there would be sufficient carbonate alkali there to re-precipitate it as aluminum hydrate.

Q. Doctor, have you given any attention to the question which Dr. Keiser was examined about, as to whether or not if an aluminum hydrate, in connection with or mixed with sodium sulphate, those being the two resultants from the baking powder used in the making of the bread, have if in that state they are passed into the human stomach and there come in contact with the human stomach, among them hydrochloric acid and perhaps other acid, there would not be a reformation or a regeneration of aluminum sulphate and aluminum soda. A. In the stomach, you say?

Q. Yes. A. I do not know.

Q. Do you know of any reason why that would not be the case? A. No reason why it would or would not be the case.

Q. Are you familiar with the laws of chemical equilibrium and mass action? A. Yes, sir; in a general way.

Q. Do you see any reason why if hydrate of alumnium and sulphate of sodium and free hydrochlorate acid are mixed together in the human stomach there would not be a re-formation of sulphate of alumnium? A. Yes, I can see a reason why that would not be the case because in the human stomach in the presence of the digestive ferments and other elements present, the physiological process may be entirely different from what takes place in a beaker glass or a test tube.

Q. Have you any reason to believe that there would be any difference in that particular case between the reaction in the human stomach and the reaction in a test tube or a beaker glass? A. By analogy, I think there would be some.

Q. What do you mean by that? A. I mean by that that I think there would be a difference in the particular case you cite.

Q. For instance, you think there would be no re-formation of the sulphate of alumnium? A. I cannot state positively. As I have stated before knowing the complex condition that would be present in the human stomach I do not believe that there would be any reformation of a double sulphate of sodium and alumnium.

Q. On what do you base that statement? A. Because hydrate of alumnium has affinity for inorganic matter and unites with inorganic matter and forms insoluble compounds.

Q. You reason that from analogy? A. I reason that from my knowledge of the conditions that would be present in the human stomach.

Q. With what particular matter will the hydrate of alumnium unite to form insoluble compounds? A. With the matter found in the albumenoids.

Q. Do I understand you to say that it may result in a chemical action which would cause the hydrate of alumnium to entirely disappear? A. My statement was that in the glass these complex conditions are not present as they are in the human stomach and, in the stomach, the hydrate of alumnium would be occupied in uniting with some of the inorganic matter present.

Q. Rendering insoluble some of the albumenoids? A. I think it would be so entirely taken up that way that there would be none left. That is to say I think there would be none left. What I know and what I think are two different things. I think it would all be taken up that way.

Q. You say that it renders insoluble the albumenoids? A. I say it would render insoluble some of the albumenoids.

Q. What, for instance? A. If the white of an egg were mixed in, that is an albumenoid that would be rendered insoluble.

Q. You say the white of an egg would be rendered insoluble? A. A portion of the albumenoid of that kind would be rendered insoluble.

Q. Then, as I understand it, it would have the effect of taking up nutrients rendering them insoluble and therefore non-nutrient and thereby their value to that extent would be impaired. Is that your idea? A. You are asking me what my opinion is. What my opinion is and what I know are two different things. I do not say that they would render insoluble all the nutrient albumenoids.

Q. You think then they would take up the non-nutrient albumenoids and leave the nutrient albumenoids? A. As I stated a moment ago, what I think is one thing and what I know is another.

Q. Your opinion is that this hydrate of aluminum, in some way goes through without doing any harm, is that it? A. My opinion is simply from observation of the use of that material in the manufacture of bread, there is no harm or no damage done by its use.

Q. By that you mean the use of an alum baking powder with its resultant compound does no harm? A. Yes, sir.

Q. And in some way, you think the hydrate of aluminum, one of the resultant compounds goes through without any harm, is that it? A. As I stated a moment ago, my opinion is based on the use of that material in baking bread and, that no harm or damage is caused by its use.

Q. I would like to have you give a catagorical answer to that question. A. I will get you to repeat the question.

Q. Your opinion is that this hydrate, in some way or other, will get through without doing any harm, is that it? A. I answer that question by stating I do not know whether it would go through without doing any harm, but my opinion is that it would not do any harm.

Q. Doctor, do you consider alum as a fit constituent of the human food? A. Not as a general proposition.

Q. What limitations would you put on it? A. For instance the limitation of its use for the specific purpose under consideration, namely, its use in the manufacture of bread. Under those conditions it is absolutely harmless.

Q. Do you think, as a general proposition that it is only under such condition that it is harmless? A. I will state as a general proposition that I think its use in baking powder, which is used in making other food products, is harmless. Other conditions might be named, but I do not think they are material.

Q. Then, in other words, you think it is harmless when mixed with other things? A. I did not state that in every case. I stated that I thought under the conditions under consideration it was harmless.

Q. Then you say as a general proposition that alum is harmless, or is wholesome in the preparation of human food when mixed with other things in the preparation of that food? A. When alum is associated with bi-carbonate of soda in the manufacture of baking powder you use it under conditions that I believe render it perfectly harmless when used in the preparation of food.

Q. Are those the only limitations you put upon it? A. Those are the only limitations I think of now.

Q. You don't think it makes any difference what amount is used? A. I will make this additional statement that its ordinary use as a constituent of the baking powder in

the proportion in which it is commonly used. I do not mean by that any impossible proportions or enormous quantities. I will state for your benefit that I know of instances recorded where common salt is known to kill a man. That would not demonstrate that common salt should be classed as poisonous. If you state impossible proportions or enormous quantities, it might be unwholesome or injurious, and the same may be said of many things that are used in the preparation of human food.

Q. You speak of using it in excess. To what extent could it be used in excess without injury? A. A slight excess would not result in any injury.

Q. What do you mean by a slight excess? A. A slight excess over what is ordinarily used in the manufacture of baking powder would do no harm.

Q. What amount is ordinarily used? A. Well, in former times, that is earlier in the history of the manufacture of baking powder, they used one spoon to a quart of flour, but more recently they have been advocating the use of two teaspoonfulls the difference being that they bulk or fill the baking powder with starch rendering it necessary to use a greater quantity.

Q. Now you say that ordinarily they use two spoonfulls to a quart of flour? A. Yes, sir; of late years.

Q. Now I will ask you to state if three spoonfulls to a quart of flour would be injurious? A. I think not.

Q. Would four spoonfulls to a quart of flour be injurious? A. I think not.

Q. Would five teaspoonfulls to a quart of flour be injurious? A. I would say that there would probably be a temporary disturbance because of the laxative effects just as the Rochelle salts would act as a laxative in case of the use of an excess of cream of tartar baking powder.

Q. Would it necessarily be a laxative effect? A. Well, an excess of baking powder would necessarily produce a larger quantity of sodium sulphate, (Glauber's Salts) which is a laxative.

Re-Direct Examination.

By Mr. Seddon:

Q. You speak of cases where the cook uses an extravagant amount of baking powder in cooking the bread? In that case the chemical reaction is the same; that is to say none of the alum is left, as alum, in the bread? A. No, the reaction would be complete, that is to say if the baking powder is made in the proper proportions there would be no difference between the reaction when you use four or five teaspoonfulls or when you use two. That is to say, only more carbonic acid gas would be driven off and, there would be a greater quantity of resulting products, of which sodium sulphate is one.

Q. Isn't it true that if baking powder is used in an extravagant manner, for instance in the quantity you suggest whether it was an alum baking powder or a cream of tartar baking powder, the effect would be the same? A. Yes, the reaction would be complete in both cases and in the case of the alum baking powder you would have a larger quantity of Glauber's Salts and in the case of the cream of tartar baking powder you would have a larger quantity of Rochelle's Salts.

Q. You gave, as an illustration, the use of ten spoonsfull of alum baking powder to a quart of flour and I understand you to say that the use of an equal quantity of cream of tartar baking powder would have about the same result? A. Yes, sir.

Q. Now what kind of a result did you refer to?

Mr. Cunningham: I object to that question and in fact to this line of examination, as it is simply taking up the time of the Court with outside matters.

The Court: I think he may answer the question. It is in evidence here that there is on the market both alum baking powder and cream of tartar baking powder and I think he may show what effect the excess of one would have as well as the excess of the other.

Mr. Seddon: I want to show that alum has no more injurious effect when used in excess, that is alum baking powder has no more injurious effect when used in excess, than any other baking powder.

The Court: Let the witness answer the question.

A. The result would be substantially the same.

Q. Why? A. Because the products of the reaction in the baking powder that are left in the bread in either case is a laxative.

Q. What is the laxative that comes from the reaction in case cream of tartar is used instead of alum? A. Rochelle Salts is the product in that case.

Q. What is Rochelle Salts? A. It is a double tartrate of sodium and potassium.

Q. I refer to its medicinal effects. A. It is a laxative or cathartic in large doses.

Q. Now you are asked whether the continued use of alum baking powder with an excess of alum would have a bad effect. I will ask you whether it would have any more injurious effect than baking powder in which an excess of cream of tartar is used? A. The bad effect would be of the same general nature. That is to say it would be the effect that comes from continued use of a large quantity of any laxative of this nature. The result would be what is termed peristalsis, by which I mean that the effect would be to pass the food so rapidly through the digestive tract that there would not be time enough to absorb all the nutrients and thereby a large part of the nutrient value of the food would be lost. It would be in effect the continued use of laxatives in large quantities and the effect would be the same in one case as in the other.

Q. Did I understand you to say if an excess of alum is used it could be detected in the bread because the sodium sulphate is bitter in a concentrated solution?

Q. Now in case of the other kind of baking powder could you detect an excess of cream of tartar? A. No, because the bi-tartrate of sodium and potassium, which is the product, is tasteless.

Q. You say that the cream of tartar would be practically tasteless? A. Yes, sir.

Q. Now when I examined you on your direct examination I put to you a hypothetical question or rather read you a hypothetical case from the testimony of Dr. Smith, and I asked you whether you could draw an inference as to the wholesomeness or unwholesomeness of bread cooked with the identical powder Dr. Smith used in making his bread, being

the Layton powder, and I understood you to say you could draw an inference that the bread would be a wholesome article of diet for people to eat. A. I limited the inference to be drawn from the experiments to the subjects of the experiments. I expressed a belief that it was a strong presumption of evidence in favor of the wholesomeness of the bread as an article of food.

Q. If an experiment is carefully made isn't it valuable in that you may deduct from it what would likely happen in general cases? A. It is valuable as confirming the views or beliefs on particular subjects, that is to say in this case it would be valuable as confirming the view or belief that such powders were what they claimed.

Q. Now with reference to a number of experiments along the same line producing the same results, would that be anything more than a confirmation or what we term accumulated evidence? A. With the same results it would merely tend to confirm what had already been done.

Q. I understood you to say in your cross-examination, that under certain conditions put to you by counsel for the state, that the introduction of hydrate of aluminum into the stomach might destroy some of the food by uniting with it and forming insoluble compounds, and in such cases, the food would pass through the stomach and through the intestinal tract, as insoluble matter. Do you think that minute quantities, such as were stated in the hypothetical question which I read to you, would destroy any large amount of food? A. My answer was based upon the customary amount of baking powder used in baking the bread. I understood from the question that the amount of baking powder used in making the bread was such as was ordinarily used in making bread.

Q. I read to you the hypothetical case in which it was stated the amount of aluminum hydrate, sodium sulphate, and phosphate of aluminum that there was in a fourteen ounce loaf of bread. Now assuming the amount of bread that a man would consume at an average meal I want to know whether the introduction, with the rest of the meal of this small quantity of aluminum hydrate would have any possible effect in destroying any of the food in the stomach by uniting with any of the food products therein and forming insoluble compounds? A. I do not think it would have any appreciable effect at all.

Q. You say it would not have any effect at all? A. It

would not have any effect that could be detected by any of the means known to science.

Q. Would it have any effect upon the health of the digester or user? A. No, sir. I want to state by way of explanation, if I am permitted, that the aluminum hydrate being present in connection with organic matter especially in the production of coloring matter results in the union of the aluminum hydrate with these colors, or this coloring matter, and there is produced what is chemically known as lakes. That is what I had in mind when I said that there was a union of the aluminum hydrate with certain of the organic matters in the stomach. And the amount that would be taken up in this way would be scarcely appreciable. It is so small that its results could not be detected if the aluminum hydrate was present in the quantity that might be left in the stomach by eating that amount of bread.

Re-Cross-Examination.

By Mr. Cunningham:

Q. You understood did you not, doctor, that Dr. Smith stated that that was the only experimental work that had been done along the line he pursued? A. I understood that none had been done along that line, that is to say none had been conducted by the steps that he pursued. I make that distinction.

Q. Are you aware of any work that is being done along that line before Dr. Smith made his investigation? A. Not along that line, exactly.

Q. How near to it, then? A. I cannot recall any particular case just now, but I know that experiments have been made and I think that I have read in physiological works of experiments conducted along the same line. I don't say they had that particular object in view.

Q. Were they experiments, with reference to the use of bread made from alum baking powder? A. They were experiments made with reference to the nutritive values of certain foods with reference to aluminum compounds and, with reference to the digestive proportions of the constituent element of the different kinds of food.

Q. How long have you known that alum was a safe thing to use when used in the proper proportions in baking

powder? A. That would be difficult for me to determine. It must have been some time during the last thirty years. That opinion has not been formed recently by any means.

Q. Have you promulgated that opinion among the people with whom you practice? A. Whenever I have been questioned regarding the matter, I have always given my opinion as I have expressed it here, that is to say I consider the alum powders as perfectly harmless. I will say that I happen to have the special knowledge with reference to this matter because I had business connections with the firm which enabled me to ascertain many things that I might not have gotten any other way.

Q. What particular brands of baking powder do you include in your list as being harmless? A. I am not here to advertise any particular brand of baking powder.

Mr. Cunningham: I will withdraw the question.

The Court: Doctor, from your knowledge of this matter I would like to have your opinion on this proposition: It is in evidence here that in making a fourteen ounce loaf of bread they used two teaspoonsful of the so-called alum baking powder. Now what would you say would be the effect if, to that quantity of baking powder, you added an equal amount of free alum. What would be the effect upon the alum if you mixed with the baking powder in that way? A. Well, in the first place, only a certain amount would be employed in uniting with the bi-carbonate of soda, infact only the amount of alum present in the baking powder would be taken up that way and the excess would enter into the compounds with some of the protoids constituents of the food. I am speaking now of the free alum that would be left in the bread after the chemical action had taken place. Of course, I will say that if there was a large quantity present there might be some disturbance, because in considerable doses it is an astringent.

Q. What would become of the free alum? A. Well, only a small portion would be neutralized by the bicarbonate of soda, and some would enter into compounds with the protoid constituents of the food as already mentioned, and the rest would be present in the stomach as free alum.

Q. You say the rest would be present in the stomach as free alum? A. Yes, sir.

Q. What would be the effect of that quantity of free alum was present in the stomach? A. Well, your question calls for about two teaspoonsful in a fourteen ounce loaf of bread. The effect would be different with different individuals. It would probably operate as a laxative, or, in some cases, would pass into the digestive canal below the stomach, without causing any disturbance that would be appreciable. The acid there would be neutralized by the alkalines there present.

Q. What would become of it finally? A. The sulphuric acid would unite with the soda and would be transferred to the circulation just like it is from the stomach to a certain extent.

Q. Then I suppose the result would be about the same as if the baking powder was used in which there were sixty per cent. alum, ten per cent. bicarbonate of soda and about thirty per cent. of starch. A. I did not undertake to ascertain the proportions under the circumstances you mentionel.

Q. Well, I will put it that way, then. What would be the effect if you used a baking powder containing sixty per cent. of alum, ten per cent. of bicarbonate of soda and ten per cent. of starch? A. A portion of the alum would be neutralized by the bicarbonate of soda and the rest would be present in the stomach under the conditions I mentioned when you spoke of adding two teaspoonsful of free alum to the bread when you were making it.

Q. Would you regard the effects in such cases as likely to prove harmful or detrimental to the health of people using such bread continuously? A. Well, made under those conditions it would be objectionable for the reasons I stated a moment ago in answer to a former question, that is to say it would be like the continued use of enormous quantities of a laxative, and, probably for a few meals would have no effect at all. But, after that, it would manifest itself and would certainly act as a laxative, and, if used continuously would have the effect I stated of causing peristalsis so that the food would be hurried through the digestive tract and much of its nutrient value would be lost. I want to say that it is singular in regard to these saline purgatives, that if they are given in small doses that they will act in a much more violent manner than if given in one large dose. I think that the abnormal use

of any saline laxative would be objectionable for the reasons already stated.

Q. Would the use of that amount of free alum affect the palatability of the bread? A. I do not think that the palatability would be changed very much because the bicarbonate of soda would be neutralized and, the chances are, that the free alum would not be neutralized until it had passed beyond the stomach and then the taste would not be apparent.

Q. Doctor, what I have stated with reference to the use of an abnormal quantity of free alum in making the bread would apply to any baking powder in which an excess of free alum were used, would it not? A. Well, of course, it would vary in degree according to the excess of free alum that you used. If a baking powder contained a quantity in excess of what you stated the action would be more violent. If it contained less, the action would not be so violent.

Q. Then you think that small quantities of alum might be used without any injurious effects? A. That, of course, would depend upon the quantity of free alum you used. As stated awhile ago if you used a large quantity it would have the effect that the continued use of a laxative would have, and of course would be injurious, but I will state to the Court that I am not aware of any baking powder containing alum in abnormal quantities. My understanding is that the amount of alum is regulated or is in proportion to the amount of bicarbonate of soda so that they neutralize each other.

Q. Now, then, take the other baking powder, the cream of tartar baking powder, suppose in manufacturing that kind of baking powder an excess of tartaric acid was used, what would the effect be? A. Only a certain amount of the tartaric acid would be used in neutralizing the bicarbonate of soda, and the rest would pass into the stomach and if present in large quantities, would act as a laxative.

Q. What would be the effect upon the general health? A. Well, it would have practically the same effect as the other in that there would be the injurious effect of the continued use of a laxative.

Q. So that if used largely in excess it would have an injurious effect? A. Yes, sir; just the same as the other.

Q. What would you say of the other variety of baking powder, the so-called phosphate baking powder? A. Well,

in that case, there would be some phosphate of soda, some insoluble calcium phosphate. The phosphate of soda is a laxative and it would have practically the same effect if used in excess as in the other cases.

Mr. Cunningham: You do not attach any importance whatever to the presence of aluminum compounds in alum baking powder? A. No, I claim that their influence is nil. As far as their influence goes they have no effect whatever upon the healthy quality of the food.

Q. And you have stated that an excess would, in your opinion, have the same effect no matter what kind of powder was used? A. I stated that an excess of alum in the baking powder or an excess of the cream of tartar in the baking powder, that is to say a quantity out of proportion to the other ingredients the effect would practically be the same.

Q. So that, in your opinion, it does not make any difference whether you use alum or whether you use cream of tartar, is that it? A. I stated that either, if used largely in excess would be injurious. I also stated that in that connection that the continued use of any saline laxative would be injurious.

Q. Now, as a matter of fact, doctor, is not the laxative power of the alum due to its irritating qualities, and as a matter of fact, if used in large quantities, it would have the effect of irritating the digestive organs? A. I do not think the irritating effect would cut any figure.

Q. You are referring now to its use in abnormal quantities? A. Yes, sir; to quantities largely in excess.

Q. Are the medical authorities agreed as to its effect? A. The medical authorities are not agreed as to whether the laxative influence is due to irritation or not.

Mr. Seddon: Doctor, the case you gave when the Court asked you some questions about an abnormal quantity of alum —did you base that upon your own experiments, or was that your opinion gained from your general knowledge of matters? A. It is my opinion gained from my knowledge of matters. I stated that if there was an excess of burnt alum, anhydrous alum, it would have a tendency to unite with some of the food products and form insoluble compounds.

Q. That opinion was based upon your general knowledge of matters? A. Yes, sir.

Q. You stated in that connection that there would be nothing indicated by the taste unless the excess was very large. Now I will ask you if that statement is based upon your own observation and experiment? A. That statement is based upon my general knowledge of the subject.

Q. And if you were told that it had been the experience of others if it had been used in excess, there was something apparent to the taste, would that modify what you have already stated? A. I was merely giving you my opinion. My opinion, like that of any one else, is not infallible, and others may have had a different opinion in that regard.

Q. Would an excess of free alum increase the leavening power of the baking powder? A. No, sir; that is to say, that if there was more free alum than was neutralized by the bicarbonate of soda the excess of free alum would not, in any way, assist in leavening the bread.

Q. And if a large quantity of baking powder was used, baking powder containing the proper proportions of alum and bicarbonate of soda, there would be no free alum left? A. No, because there would be enough of bicarbonate of soda to neutralize it.

The Court: As I understand your answer then, if an excess of baking powder was used, you would merely have an excess of carbon dioxide? A. Yes, sir.

Q. And if you used a normal quantity of baking powder and added an equal quantity of free alum, it would not increase the leavening power at all? A. No, sir.

At this stage of the examination a recess was taken until 2 p. m.

At 2 p. m. further proceeds were had as follows:

Present—As before.

Mr. Seddon: I will now read in evidence the deposition of Herman Gidionsen, John Becker, Jr., and Mrs. Charles T. Bigelow.

Mr. Cunningham: I make the same general objection to the introduction of those depositions as I made to the introduction of any of this testimony.

The Court: I will take it subject to your objections.

The depositions of Herman Gidionsen, John Becker, Jr., and Mrs. Charles T. Bigelow were then read as follows:

HERMAN GIDIONSEN, a witness of lawful age, being produced, sworn and examined, testified, on the part of the defendant, as follows:

Direct Examination.

By Mr. Seddon:

Q. Mr. Gidionsen, please give us your full name. A. Herman Gidionsen.

Q. State where you reside. A. I reside at No. 1555 South Broadway. That is, that is my place of business.

Q. You live in the city? A. Yes, sir.

Q. You are of lawful age, are you not? A. Yes, sir.

Q. What business are you engaged in, Mr. Gidionsen? A. I am engaged in the grocery business.

Q. In your business, do you sell what is known as alum baking powder? A. Yes, sir.

Q. To what extent do you sell them? A. We sell them very extensively.

Q. In this state? A. Yes, sir; in this state and Illinois, both.

Q. What brands do you chiefly handle? A. Well, our larger sales are the Bon Bon and Grant's Improved, and the Jack Frost.

Q. What are the prices at which these are sold? A. The Bon Bon and Grant's Improved is selling at ten cents.

Mr. Cunningham: Ten cents what? A. Ten cents a pound, and Jack Frost generally at twenty-five cents a pound.

Mr. Seddon (resuming): What is your experience as to satisfaction that these baking powders have given to the trade? A. It seems to give universal satisfaction the way they are

called for. The order is always repeated from the same parties.

Q. State what complaints, if any, you have ever heard from parties who bought and used the baking powders as to their injurious nature? A. Well, I have never heard any complaint from them that I know of.

Q. How long did you say you had been in business? A. About twelve years.

Q. Can you give us any idea to what extent alum baking powders are sold in the trade in the state of Missouri? A. Well, I should estimate, taking my own sales into consideration, about three-fourths.

Q. I don't ask you with reference to any other baking powders, but to what extent are the goods sold in the state of Missouri? A. Well, I have no idea as to the amount. I couldn't estimate that.

Q. Do you know whether they are generally sold by all grocerymen in the state? A. I am satisfied they are.

Q. You speak from your general knowledge of the trade? A. Yes, sir.

Q. These goods are sold in cases, aren't they? A. Yes, sir.

Q. How many cans are usually to a case? A. Well, they vary. Generally two dozen in a case—pound cans.

Q. What was the average per case do you think? A. They would average about twenty-four pounds to the case.

Q. How many cases would you average in your business a month? A. About twenty, twenty-five, something like that.

Cross-Examination.

By Mr. Cunningham:

Q. Are there any other alum baking powders besides the three you have mentioned which you sold usually, or have sold in your business? A. Yes, there are quite a number of others that we have handled and discontinued, though I cannot just recall the names of them.

Q. Now this Bon Bon you speak of, that, you are sure, is an alum powder is it? A. It is represented to be.

Q. Do you know anything about the fact as to whether it is or is not? A. That I do not know; no, sir.

Q. Who represents it to be an alum baking powder? A. Well, the manufacturers.

Q. Who are they? A. The parties that manufacture the Bon Bon, Grant's I believe, is the firm name.

Q. Where do they do business? A. I think their headquarters are in Chicago.

Q. Have they any manufactory for alum baking powders in Missouri? A. Yes, I think there are quite a number of them.

Q. No, I mean the Grant people. A. Oh, the Grant. Yes, sir; there is the Grant Manufacturing Company in this city also.

Q. Is that a different company? A. That is a different company.

Q. What is the exact style of the Chicago concern? A. The Bon Bon; that is their brand.

Q. Yes, but what is the name of the firm that manufactures it? A. I think it is J. G. Grant Manufacturing Company.

Q. What is the style of the firm that manufactures baking powders in Missouri that have the name of Grant? A. I think it goes under the name of Grant Manufacturing Company.

Q. Grant Manufacturing Company? A. Yes, sir; that is the style of it. I am not certain, but that is my impression of it. I have taken no particular pains to look.

Q. Where is that Missouri manufacturer, Grant, located? A. I can't say, exactly.

Q. In the city? A. Yes, sir; in the city.

Q. Now you spoke of Grant's Improved. A. Yes, sir.

Q. How do you know that it is an alum baking powder? A. Well, I don't know; just what I have heard.

Q. Has the Bon Bon ever been represented to you verbally or in writing, as being an alum baking powder? A. Oh, yes; the salesmen have represented it that way. They wouldn't expect it to be any thing else.

Q. Why not? A. Because they could not use any—I can't recall that name now—the ingredients they use.

Q. Cream of tartar? A. Cream of tartar, yes, sir.

Q. They couldn't use them? A. Yes, sir.

Q. And sell it at ten cents a pound? A. Yes, sir.

Q. What do they sell that to you at, per can? A. How?

Q. The manufacturer? A. This Improved, you mean?

Q. Yes. A. They sell it to us at the rate of seventy-five cents a dozen pounds.

Q. Tell us, what does that make a pound? A. About six cents a pound.

Q. Twelve pounds for seventy-five cents, is that it? A. Yes, sir; it amounts to a fraction over six cents.

Q. That would be just six and a quarter cents? A. Yes, sir.

Q. Per can? A. Yes, sir.

Q. You buy it, of course, in cases and not in cans, but that is what it comes to a can? A. Yes, sir.

Q. That gives you a profit of three and three-quarters cents a pound. A. Yes, sir.

Q. Do you know any further than the matter is represented to you by these manufacturers, whether or not any of these powders actually contain alum? A. No, sir.

Q. Or if they do, how much of it? A. No, sir; I don't know.

Q. You don't know of your own knowledge what is the actual chemical composition of any of these powders? A. No, sir; I do not.

Q. Now you say the Jack Frost sells for twenty-five cents a can? A. Yes, sir.

Q. What is the reason for the difference in price between Jack Frost and the other two brands you have named? A. Well, the Jack Frost is sold at twenty-five cents a can—a pound.

Q. As against ten cents for the other? A. As against ten cents; yes, sir.

Q. That is two and a half times as much? A. Yes, sir.

Q. What is the reason for that difference in price? A. I think they claim cream of tartar in it to a certain extent.

Q. Alum also? A. Whether they claim alum in that I don't know. I never heard that represented.

Q. You are not correct then in classing the Jack Frost as among the alum powders you deal in? A. I would class it that way.

Q. Tell us why, if you don't know it contains alum? A. Because they could not use any other ingredients to make it at that price.

Q. You think it must have some alum in it to enable them to sell at that price? A. Yes, sir.

Q. In other words, you mean to say you don't think it would be possible to make the Jack Frost baking powder and sell it at twenty-five cents a can without replacing part of the cream of tartar with alum? A. Yes, sir; that is my idea exactly.

Q. Have you any idea what part of the cream of tartar would have to be replaced by the alum in order to sell it at that price? A. No, sir.

Q. You really never, I suppose, made any calculations of this sort I am asking you for? A. No, sir; I have not.

Q. And you are giving simply your best impression about that? A. Yes, sir.

Q. What do you pay for the Jack Frost? A. I think it is $2.25 a dozen, or $2.00, I am not quite certain.

Q. That would be, if it is $2.25 a dozen, 18 3-4 cents, wouldn't it. A. Yes, sir.

Q. Per can? A. Yes, sir.

Q. You have been in business you say twelve years. A. Twelve years, yes, sir.

Q. How long have you been engaged in selling alum powders? A. About the same time.

Q. How long have you sold this Jack Frost? A. Well, I have only handled that for about a year I guess. A year or two.

Q. Do you handle less or more of the Jack Frost than the other brands you have spoken of, the Bon Bon and Grant's Improved? A. Well seventy-five per cent more of the ten cent than the twenty-five cent goods.

Q. And you think it is the cheapness that makes that increase in the sales? A. Yes, sir.

Q. You were asked on your direct examination whether you had ever had any complaints made about the injurious effects of any of these powders, and you said you had not, I believe? A. Yes, sir.

Q. Did you ever make any special inquiries about this? A. Yes, sir; I think I have in many cases.

Q. Well, what were they? A. We had some other brands that we wanted to introduce and on which we had special inducements, but we found that they wanted that particular brand they had been using, the Bon Bon or Grant's Improved whichever one they used.

Q. But you didn't make any inquiry as to whether they found it was wholesome or unwholesome, did you? A. No, sir, I have never did that.

Q. You just took it for granted that because they said they wanted that particular brand and had been using it that they found it all right? A. Yes, sir.

Q. That is the inference you drew? A. Yes, sir.

Q. Now you said that your belief was that alum baking powders are sold by all the groceries in this State? A. Yes, sir.

Q. What are your opportunities for knowing about that? A. Well, we have quite a jobbing trade over the State and everyone of them that is the only kind of baking powder they buy.

Q. From you? A. Yes, sir.

Q. They don't buy any of the cream of tartar powders? A. I have never sold a case in this State that I know of.

Q. Have you ever bought any to try to sell? A. I have it always on hand.

Q. Never sold it? A. Never sold it.

Q. In the State. Have you made an effort to sell it in the city? A. Which?

Q. I mean the cream of tartar powders? A. Yes, sir.

Q. You say you found you couldn't do it? A. Yes, sir; we sell it certainly.

Q. You sell it in the city but not in the country. A. Not in the country.

Q. You don't deal with all the groceries in the State do you? A. No sir. We have a perfect trade in the country.

Q. Do you think that you deal with one-half of all the groceries in the State? A. No, sir.

Q. Do you think you deal with one-third of them? A. No, sir.

Q. Or one-fourth of them? A. No, sir; I don't think we do.

Q. Do you mean to say then as far as you know—from your experience with the people that you have sold them to,

that your impression is that they are sold by all the groceries. But your impression simply comes from the fact that you sell so many? A. I have seen them in stores over the State.

Q. But you haven't seen them in all the stores? A. Not all of them, but I haven't been in a single store but that I have seen them there. In our business we generally look around when we get into a new place of business.

Q. Grocers generally keep a different kind of different brands of these as well as of other goods don't they? A. Well, as a rule it is always these cheap brands.

Q. These cheap brands? A. Not these exactly, but others.

Q. But these cheap brands, and I understand you as far as you know these cheap brands are always alum powders? A. Yes, sir.

Q. And never cream of tartar powders? A. No, sir.

Q. Do you know what proportion of those in the city who do sell alum powders also sell cream of tartar powders? A. No, sir; I do not know.

Q. I suppose that has not been a subject of investigation as to how many have been selling them? A. No, sir.

Q. These alum powders that you do sell and which you said you thought would be from twenty to twenty-five cases per month, where are they generally sold? A. They average about the same.

Q. You mean about half and half? A. Yes, sir.

Q. And your general trade aggregated up in all the things you do sell, how does that compare? What proportion of the total sales would be in the city, and what proportion in country? A. Well, I couldn't answer that.

Q. I don't ask for an exact statement. A. Well, about half, I should judge.

Q. So that your sales of those alum powders in the city and the country bears about the same relation to each other that your general sales do? A. Yes, sir.

Q. Are these alum powders that you sell stamped with any writing or indication that they contain any alum? A. That I do not know. I have never taken that much interest in them to read it.

Q. So you can't tell whether a person who buys them from the retailer understand whether it has alum in it or not, do you? A. No, sir.

Q. You don't know anything about it as far as you are aware? A. No, sir.

Q. The knowledge that it contains alum is confined to those people that deal in it, not those that eat it as far as you know? A. Yes, sir.

Redirect Examination.

By Mr. Seddon: Mr. Gidionsen, these powders are represented to you by the parties selling them to you as being alum powders, are they not? A. Yes, sir.

Q. And are sold at such a price that it would indicate that they are alum powders, would it not? A. Yes, sir.

Q. And when they are purchased from you they are understood to be alum powders, are they not? A. Yes, we represent them as alum powders.

Q. What do you do with reference to extending your business by way of solicitation of the trade? A. Well, of course our object is in getting parties in the store that we try to sell them as many goods as possible. That is about the only way I can answer that.

Q. What do you do with reference to watching out for the state of the trade in view of extending your business? A. Well, we have circulars—issue circulars; send them out advertising certain goods.

Q. Have you any travelers? A. No, sir; not in this State.

Q. Do you travel yourself any? A. No, sir; they always come unsolicited. They all come by letter or wagon. Our orders come by mail.

Re-cross Examination.

By Mr. Cunningham: Now you talk about sending out your circulars. Of course they are printed circulars. A. Yes, sir.

Q. You never, in any of those circulars, used the word alum in connection with the powders you are advertising? A. No, sir; we just name the brands.

Q. And as far as you know the retail dealer, when he is going to sell those powders, he never calls the attention of the purchaser to the word alum, or the fact that the pow-

der contains alum, does he? A. No, sir; I don't think he does. I don't know whether that is done. It may have been done.

Q. But as far as you know they are not? A. No, sir; they are generally represented as alum. We generally represent it as an alum powder if we ship a new customer and they ask for it.

Q. We are getting away from the question. You say you don't, in your circular, use the word alum. A. No, sir.

Q. And I understood you to say as far as you know it is a question now what the retailer says to the consumer—as far as you know the retailer in selling these alum powders doesn't tell the purchaser these are alum powders. You don't know of his doing that? A. No, sir.

Q. He sells it by the brand? A. Yes, sir.

Q. And the brand itself doesn't contain the word alum does it? A. No, sir.

Q. As far as you know? A. No, sir.

Signature waived.

JOHN BECKER, JR., a witness of lawful age, being produced, sworn and examined testified, on the part of the defendant, as follows:

Direct Examination.

By Mr. Seddon: Will you please state your full name and where you reside, and whether you are of lawful age? A. My name is John Becker, Jr., 1270 and 1272 South Broadway. I am of lawful age.

Q. You are engaged in the grocery business, I believe. A. Yes, sir; in the grocery business.

Q. How long have you been engaged in that business? A. Why, about twelve years. I have been in the business—I had an interest in the business for myself during that time, but I have been on that corner for twenty years.

Q. What is the style of your firm? A. John Becker, Jr.

Q. In the course of your business do you handle and sell what are known as alum baking powders? A. Yes, sir.

Q. How long have you done so? A. For the last twenty years—during all my time in business.

Q. Do you sell them very extensively? A. Yes, sir.

Q. What would be the amount of your sales do you suppose. A. Why, I should judge from fifteen to twenty cases a month. That would be the average of all the brands.

Q. How many in a case? How many cans in a case? A. Usually two dozen pound cans to the case.

Q. Each of these cans contain a pound do they not? A. Yes, sir.

Q. You are somewhat familiar are you not, with the trade in Missouri in alum baking powders? A. Well, I don't know much about the business outside of the city of St. Louis.

Q. Do you think you are somewhat familiar with it in the city of St. Louis? A. Yes, sir; I am.

Q. Will you state to what extent these alum baking powders are sold by grocerymen in the city of St. Louis. A. Well, from my knowledge they all carry them quite extensively.

Q. These alum baking powders? A. Yes, sir.

Q. State what your experience is as to the satisfaction given by these powders that you have sold with people that have sold them to, and what complaints, if any, have been made to you with reference to their injuriousness? A. I haven't had any complaints to my knowledge.

Q. They sell right along do they? A. Yes, sir; they do.

Q. What brands do you handle? A. I handle the Bon Bon and the so-called Champion and Jack Frost. We have handled other powders, but there are new powders coming into the market taking the place of the old ones.

Mr. Cunningham: By us you mean by yourself? A. Yes, sir; by myself.

Mr. Seddon: How many classes of baking powder are usually sold in the trade? A. Well, there are two to my knowledge.

Q. What are they called? A. One is the cream of tartar powder, and the other the alum powder.

Q. Is there a well known distinction made between these powders in the trade? A. Yes, sir.

Q. In which class do those brands that you say you have sold fall, alum or the cream of tartar? A. Why, the alum.

Q. Are they well recognized as alum baking powders by the trade? A. Yes, sir.

Q. Do you know by whom the cream of tartar baking powders are made? A. Yes, sir. They are made by the Dr. Price Baking Powder Company, Royal Baking Powder Company, and the Cleveland Baking Powder Company, I think it is.

Cross Examination.

By Mr. Cunningham: You don't mean to say every grocer in the city of St. Louis sells these alum powders do you, Mr. Becker? A. I really think so.

Q. I want to know what you know about it. Do you mean you know it? A. I don't know that every grocer handles them.

Q. Do you know of your own knowledge that as many as half of the grocers in St. Louis do? A. I do, yes sir.

Q. You do. How do you get at that? A. From a general knowledge of the trade.

Q. How many grocers are there in the city of St. Louis? A. I should judge about twenty-five hundred.

Q. Do you know? A. I don't know the exact number.

Q. Then if you don't know the exact number, how can you assert as a fact that half of them sell these alum powders. A. I simply say I think.

Q. That is quite a different matter. But you don't know of your own knowledge. A. No, sir.

Q. The answer that you have given is not that you have an absolute, positive, personal knowledge, but that as a man engaged in the grocery business and speaking from the knowledge that you have had as such of the general course of trade you express that as your belief and opinion? A. Yes, sir.

Q. And that is all you do? A. Yes, sir.

Q. Do you still continue to sell these three powders that you have named, the Bon Bon, the Champion and the Jack Frost? A. Yes, sir.

Q. Are you aware that at the last session of the Legislature a law was passed making that an unlawful thing? A. I heard of it, yes sir.

Q. Has the passage of that act had any effect upon your conduct as to your selling or not selling those powders?

Objected to on the ground that it is wholly immaterial in this suit, and counsel for defendant instructs the witness that such evidence having a tendency to criminate him he has a right to refuse to answer.

Mr. Seddon: You are entitled to decline to answer that question, Mr. Becker.

The Witness: I prefer to decline.

Mr. Cunningham: On the ground that it might criminate you? A. Yes, sir.

Q. What, if any, assurances have you received from manufacturers or from persons that they would see you harmless from any loss or penalty under this law if you did continue selling them?

Objected to on the same ground as above, and that evidence such as this will have a tendency to criminate the witness as participating in and aiding and abetting in violation of law.

Mr. Seddon: You have a right to decline to answer that question, Mr. Becker.

The Witness: I understand. Why, I have received no assurance from anyone.

Q. Have you seen any publication or notice of that sort?

Objected to as being immaterial.

Q. Have you seen anything of that sort? A. I have not.

Q. Do you mean to say you have never heard up to this time that there was anybody or set of persons who under-

took to protect dealers in alum baking powders from prosecution or penalty, is that what you mean to say?

Objected to as being immaterial.

A. I will answer that I have not.

Q. You said in your direct examination that baking powders are embraced in two classes, and are known in the trade, first, as cream of tartar baking powders, and the other class as alum baking powders. A. Yes, sir.

Q. Are these alum baking powders advertised and offered in the trade as being powders that contain alum? A. No, sir; they are not.

Q. Why not? A. Well I can't state that.

Q. They are simply put on the market as cheap baking powders? A. Yes, sir.

Signature waived.

MRS. CHARLES F. BIGELOW, a witness of lawful age, being produced, sworn and examined, testified on the part of the defendant, as follows:

Direct Examination.

By Mr. Seddon: Mrs. Bigelow, will you please give us your full name and state where you reside. A. Mrs. Charles F. Bigelow, 5025 Cabanne Avenue.

Q. Are you married, madam? A. Yes, sir.

Q. Have you been engaged in keeping a boarding house? A. Well, you know my mother keeps the house, but I live there with her.

Q. For how long? A. For about—well always have lived in it. I guess we have been living here about fourteen or fifteen years.

Q. Have you been keeping boarders all of that time? A. Yes, sir.

Q. At that place? A. Oh no, we have only been there a little over a year.

Q. How many boarders do you think you average at a time? A. We hardly have over twelve—about twelve.

Q. About twelve? A. Yes, sir. There are twelve in the house.

Q. What would then be the size of your household including the members of your own family? A. About twelve.

Q. About twelve altogether? A. Yes, sir.

Mr. Cunningham: Boarders and members of the family together? A. Yes, sir.

Mr. Seddon: Are there any children? A. I have three.

Q. You have three? A. Yes, sir.

Q. Have any of the others children? A. No, sir.

Q. How old are your children? A. One is 15, and the other is 12, and this little one here is six.

Q. Now have you used in your cooking in your family what are known as alum baking powders? A. Well, we use the baking powder Jack Frost, and we have used several different brands, but I wouldn't say the word alum was on the box.

Q. Have you used the Bon Bon? A. Yes, sir.

Q. Do you remember any other that you have used? A. Well, I don't think I do.

Q. Have you used the Champion? A. I don't remember that at all.

Q. One Spoon? A. No, sir.

Q. Layton's Quick Food? A. Yes, sir; we have used a little of that too. We generally change our baking powders with the cook. Whatever she wants. Sometimes they want one thing, and sometimes another.

Q. State what were your observations with reference to the health of your family, including your children? A. They all seem healthy. I never hear any complaint from them. My children are all very healthy. Like children, of course, they have spells, but it don't amount to anything.

Q. What are your observations with reference to the injuriousness or the opposite of the use of these baking powders in your family? A. I don't see any injuriousness. They make very nice bread, and all seem to enjoy it.

Q. What complaints, if any, have you ever heard with reference to the indigestibility of bread that is made with these baking powders? A. Well, we eat a great deal of hot bread, and we have it twice a day; all eat it and seem to be

well. I eat it myself all the time and I never had indigestion in my life.

Q. You have never had indigestion? A. Never did.

Q. What would you say with reference to your children on that point? A. My children are perfectly healthy.

Q. They eat this bread made from alum baking powders do they? A. Yes, sir; they eat the bread all the time. We use very little bakers' bread; we make all our bread.

Q. Do you use it in any other form of foods such as cakes and pies? A. Yes, sir; we make all of our cakes too. But we hardly ever use baking powder in pies.

Q. This little boy that I see here is one of your boys is he? A. Yes, sir. That is my youngest.

Q. Is he one of the children that you refer to? A. He is one of them, yes sir.

Q. What is his present appearance as to healthfulness? A. He has always been perfectly healthy.

Q. Seems to be a pretty healthy looking specimen? A. He never has had anything. He did have the measles; all my children have. He complains now and then, but so far as his stomach is concerned he is perfectly healthy.

Cross-Examination.

By Mr. Cunningham: How long has this establishment run in which you had on an average about twelve boarders —or rather twelve members of the family, including boarders. How many years did that continue? A. Well, it has been always. Had the same in the house some for over a year, some of them for eight years and some nine years, and some seven.

Q. You think, then, that for eight or nine years on an average you have had about twelve in the family? A. Yes, sir; about twelve in the family.

Q. Do you know that these baking powders that you have used during that time actually contain alum or not? Do you know whther they did or did not? A. No I don't know that.

Q. From whom did you buy them? A. We buy them from our groceryman. The Jack Frost from Mr. Gill.

Q. Did he tell you that they contained alum? A. He did not.

Q. From whom do you buy the Bon Bon? A. I couldn't say. We buy some from Mr. Gill and we also buy from Dougherty. I couldn't say exactly from which.

Q. Did he tell you that powder contained alum? A. He did not.

Q. And as to the other powder, the Layton's Quick Health Food, do you know whether that contains alum? A. No, sir; we never used that but a little while. I never knew it contained alum.

Q. Did anybody ever tell you that it contained alum? A. Nobody ever told us it did.

Q. Did you ever say to any of the boarders in the family that you used baking powder that contained alum? A. No, sir.

Q. You never knew it as a matter of fact? A. No, sir.

Q. When did you first learn—when was it first suggested to you that those baking powders did contain alum? A. I don't know.

Q. It has been suggested to you now surely that they do contain alum hasn't it? A. I don't know. I didn't know they contained very much alum.

Q. Did you know they contained any alum? A. I guess they did.

Q. How did you find that out? A. Well, to tell you the truth I don't know whether I knew it or not because I never though about their having alum in them.

Q. You wouldn't prefer to use a baking powder that had alum—or rather that had any alum in it if you knew it?

Objected to as immaterial.

A. If there was not enough in it to hurt us I wouldn't care.

Q. How would you tell if there was. That there wasn't enough in it to hurt you? A. I never tried.

Q. I suppose of course, Mrs. Bigelow, that your children from time to time have had disturbances of the digestion haven't they? A. I never knew them to have anything like indigestion. They once in a while have a little bilious attack. But all my children have always been very healthy.

Q. Did you ever know one of them to have diarrhoea? A. No only when they were babies cutting teeth.

Q. Never since that? A. Not that I know of.

Q. Not a single one of them? A. Not that I know of.

Q. Have you ever known them to be indisposed otherwise than bilious attacks? A. Except a weak throat.

Q. They have been perfectly healthy with the exception you have stated? A. Perfectly healthy, yes sir.

Q. Never had a spell of sickness? A. They have had fevers and weak throats.

Q. You say they have had fevers. Do you know what produced the fever, what caused it? A. My girl had the measles, measles and typhoid fever about five years ago.

Q. Do you know what brought on the typhoid fever? A. I sent her to school too soon after she had the measles.

Q. What are the other members of your own family besides yourself and your three children? A. My mother, my sister, her husband and my husband.

Q. Have none of them ever had any sickness or attacks of indigestion and intestinal troubles of any kind? A. My brother weighs 185 pounds, he don't look like it.

Q. What would you say as to the others? A. My sister has always been healthy. She is not as healthy as I, but she never had any dyspepsia. None of us ever had that.

Q. And the other members of your family? A. My mother is along in the seventies and she is pretty healthy.

Q. Have you always got whatever baking powder your cook called for? A. Well, we have a good deal. We have used a good many baking powders.

Q. Can you think of any others than the three you have spoken of that you have ever used? A. We used Price's, we have used the Royal. I don't know how many others.

Q. Do you know whether the Price's contains alum? A. I do not. We prefer the Jack Frost because it is cheaper and we find it answers every purpose.

Q. It is cheaper than what? A. Than Price's.

Q. Is it cheaper than Bon Bon? A. I don't know. We never used that very much.

Q. Do you know the relative prices of the Jack Frost and the Bon Bon? A. I do not. The Jack Frost is twenty-five cents a pound.

Q. Do you know what the Bon Bon sells for or the Layton's Quick Food? A. I think it is ten cents.

Q. Why do you use the Jack Frost in preference to

the Layton's Quick Food if that is a fact? A. I told you we generally used according to what cook wanted.

Q. That was you guide usually? A. Yes, sir; usually our guide.

Q. Do you prefer to use the Jack Frost to using the Price's or the Royal powder? A. Because it is cheaper.

Q. You prefer it because it is cheaper? A. Yes, sir.

Q. But what any of them contains or doesn't contain you have no knowledge yourself? A. No, sir; we supposed they were good.

Signature waived.

DR. LEGRAND ATWOOD, a witness of lawful age being produced in open court, sworn and examined on the part of the defendant, testified as follows:

Direct Examination.

By Mr. Seddon: State your full name. A. LeGrand Atwood.

Q. Where do you live? A. I do business here in St. Louis. My residence is at Ferguson, St. Louis county.

Q. What is your occupation. A. I am a practicing physician.

Q. Is yours a general practice? A. Yes, sir.

Q. How old are you? A. 67 years of age.

Q. How long have you been practicing medicine. A. For 49 years.

Q. Continuously? A. Yes, sir.

Q. Have you had a large practice during that time? A. I have had an average practice.

Q. Has that practice been here in St. Louis? A. Yes, sir, mainly.

Q. Doctor, you were here in the court room, sitting near the witness stand, were you not, when I read the hypothetical case to Dr. Merrell, based upon the deposition of Dr. Smith taken in New York? A. Yes, sir.

Q. You had that question submitted to you before so that you are familiar with it? A. Yes, sir.

Q. Have you considered the matter contained in the hypothetical case? A. As far as it was possible for me to do so, as opportunity offered.

Q. Now will you state whether or not you have been able to draw any conclusions from that case as to the effect upon the health or digestion the bread would have used as a regular daily diet by mankind? That is of course bread baked with alum baking powder. A. Yes, sir.

Q. What is your conclusion with reference to the effect? A. I am assuming now that the bread you refer to is cooked with the same powder that Dr. Smith used, and the conclusion that I draw is that the use of alum baking powder in the manufacture of bread is not injurious to the health of the individual using the bread and does not, in any way, interfere with the processes of digestion.

Q. What conclusion did you then reach with reference to the wholesomeness or unwholesomeness of such bread as a regular article of diet. A. The conclusion I reached was, that its use in baking the bread did not interfere at all with the bread as a nutrient material; that is to say I reached the conclusion that the bread is just as nutritious and wholesome as it would be if baked in any other way so far as it is applicable to building up the tissues of the body.

Q. I read a second hypothetical case in which the loaf of bread weighing 14 ounces, avoirdupois, baked with a straight alum baking powder, contained .16 of 1 per cent. of aluminum hydrate and .16 of 1 per cent of sodium sulphate, and that another loaf which had been baked with a phosphate alum powder contained .46 of one per cent. of sodium sulphate, .13 of 1 per cent. of aluminum phosphate and .8 of 1 per cent. of calcium phosphate, now what effect, if any, would the presence of these elements in the bread have upon the human system, that is to say the amounts I have already stated if present in a 14 ounce loaf of bread. What effect would they have upon the health or digestion of a person if used as a regular article of diet. A. I do not believe they would have any detrimental effect whatever.

Q. You have been practicing quite a number of years have you not? A. Yes, sir; 49 years.

Q. And yours has been a general practice. A. Yes, sir.

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Q. Will you state whether or not in your practice and experience as a physician you have ever had a patient who had a diseased condition of the digestive organ which you attributed wholly or in part to the use of alum baking powder in the preparation of food. A. I never had such a case.

Q. Did you ever have your attention called to such a case in your medical experience. A. No, sir.

Q. In your experience as a physician have you been led to attribute any functional disorder or diseased condition to the use of alum in baking powders used for the preparation of food? A. No, sir.

Q. Do you know of any standard medical works where a case has been recorded describing the diseased condition of the body or any disorder of the digestive organs due to the use of alum baking powder in the preparation of food? A. I do not know of any such case being recorded in any standard medical work.

Cross-Examination.

By Mr. Cunningham: Doctor, what are the medical and therapeutic effects of alum. A. Astringent, laxative, emetic and protective.

Q. What is a dose as a medicine? A. For what purpose?

Q. For astringent purposes. A. Six to eight or ten grains.

Q. As an emetic? A. Two tablespoonfulls may be given as an emetic.

Q. What amount is given as a laxative? The same as for an emetic.

Q. How is that? A. If it did not act as an emetic it would act as a purgative.

Q. So you would give about the same dose whether you wanted it to act as a purgative or as an emetic. A. Yes, sir.

Q. Which would be from one to two tablespoonfulls? A. Yes, sir; or more.

Q. How much more? A. Well, three or four tablespoonfuls would not make any difference. It is a remedy which regulates itself and is readily gotten rid of one way

or the other either as an emetic or a purgative when taken into the human body.

Q. What are the medical or therapeutic properties of hydrate of aluminum? A. Absorbent, protective, alkaline and antacid.

Q. What would you consider a dose of hydrate of aluminum? A. For what?

Q. For any purpose for which you would give bismuth.

Q. Well for what? A. I say for any purpose for which you would use bismuth as a remedy you would give about 12 grains of hydrate of aluminum internally.

Q. Is it used in any other way? A. Yes, sir; it is used externally in the treatment of wounds where it is applied as a powder ad libitum.

Q. What effect does the hydrate of aluminum have when used externally for burns or wounds of that character? A. It has what I would call a protective effect.

Q. What effect does it have when used internally? A. Its effect is wholly mechanical. It sometimes is used to coagulate the albumen to protect the mucous membrane.

Q. As an astringent whether used internally or externally does it have a tendency to produce a contraction of the capillaries? A. That would depend upon the case.

Q. Well, for instance, you had a hemorrhage from the stomach which you wish to stop. A. Well, doses of four grains of alum might be used as an astringent. It has a styptic effect.

Q. Then it does act as an astringent and has a tendency to contract the capillaries. A. It would have a tendency to lessen the hemorrhage of that kind and that might be by forming a coating over the mucous surfaces.

Q. Doctor, if you had in a loaf of bread 1-50 of an ounce of aluminum hydrate and that bread went into the stomach, you would have then about eight grains, would you not? A. Yes, sir.

Q. That would be rather more than the amount you mentioned as an average dose for astringent purposes. A. You are speaking now of the hydrate of aluminum.

Q. Yes. A. I didn't say that the hydrate was administered for astringent purposes, I said it was administered as an absorbitant or protective or as antacid.

Q. As an antacid. A. Yes, in its effect there it re-

sembles magnesia.

Q. Then for antacid purposes for which it is administered this 1-50 of an ounce would be more than the amount you indicated as being the proper amount to administer as a dose? A. The dose I indicated was about six grains.

Q. Now as an antacid does it unites with anything in the stomach to form soluble compounds? A. Yes, sir.

The Court: Actually or theoretically? A. Actually.

Q. What is the combination? A. Hydrocholoric acid.

Mr. Cunningham: Would such soluble compound differ in any way or in any degree from the alum itself. A. I have not qualified as a chemist. The exact condition which would result from such a compound I am not prepared to state. I will state though that if its effect would not be at all poisonous and would be classed as a non-poison.

Q. The question is would you regard it as different in any way from the effect of the alum itself. A. In what way?

Q. The medicinal and therapeutic effect. A. I am not prepared to state whether it would have the same effect as the alum or not.

Q. Now, doctor, the clinical authorities state that the prolonged administration of alum produces chronic catarrh of the stomach, emaciation, etc. Now is it not reasonably supposed that the other salts of aluminum will act in a similar manner. A. I have no practical knowledge on that point, as the result of my observation in the practice of medicine that the persistent use of alum or its salts in any form produces catarrh of the stomach or digestive canal. I am not positive that such would be the case.

Q. Are you positive that such would not be the case? A. Alum in its own form is an irritant to those parts with which it comes in contact. However, it will form a coating protecting the mucous membrane with which it comes in contact and it is pretty hard for me to say that it would have the effect that you mention. I am not positive on that point.

Q. What you have said relates to alum itself. A. Yes, sir.

Q. Now then I ask you if, in your opinion, it is not reasonable to conclude that the other salts of aluminum will have a similar effect? A. I am not prepared to answer that question because I can say that they would have a similar physiological effect.

Q. Are not the salts of aluminum in solution astringent? A. Yes, sir.

Q. Then what reason have you for doubting that the other salts of aluminum will have an effect other than the effect of the alum, that is why do you doubt that they will have a similar effect? A. I have absolutely no knowledge in that direction.

Q. I suppose, doctor, the opinion you have expressed about the non-interference with the operation of digestion, of the alum in the baking powder, was based upon the baking powder used by Dr. Smith in his testimony and, under the circumstances and condition, under which he made his experiment. A. With reference to the hypothetical case, yes, sir. His testimony there, as the result of his experiments, lead me, as a practitioner of medicine, to the conclusion that no injurious results came from the use of the alum in the baking powder, taken in connection with my observation as an individual.

Q. What do you refer to now? A. I refer now to my observation extending over many, many years as a practitioner of medicine never having had a case where I could detect any unfavorable results and attribute them to the use of the alum in the baking powder. In other words in all my practice I have never had a case of sickness of any kind that I thought could in any way be attributed to the use of alum baking powder in the preparation of food.

Q. How long have you been using alum baking powder in your family? A. For a year or two. I will state in that connection that we have used the very brand you now have under discussion. I have had that baking powder used in the family in the preparation of food and, I will state that if I thought its use was in any way injurious, I would not have it in the house.

Q. Haven't you ever been called upon to treat cases where you thought the digestion had been interfered with from the use of alum in the baking powder. A. No, sir; never in all of my experience. I have never had a case where I

thought any disturbed condition was due to that cause.

Q. Is it not a fact that a disordered condition might result which you would attribute to one cause, when, as a matter of fact it might be attributed to the use of alum in the baking powder? A. We generally take into consideration all of those things in making a diagnosis of the case.

Q. There have been, I suppose, instances in your family where the members of it have been troubled with indigestion and constipation from time to time. A. Yes, sir, undoubtedly.

Q. Did you ever trace the cause of such disturbance to the use of alum used in the baking powder used in the preparation of the food. A. Yes, I have always considered those things, and I have reached the conclusions that I have already stated, and that is that I could not trace any injurious effects to the use of alum in the baking powder.

Q. Is it not a fact, doctor, that you might attribute the disorder to one thing when, as a matter of fact, it should be properly attributed to the use of alum in the baking powder? A. No, I never saw a case in my own experience, nor did I ever see a case recorded in the books where I thought that the use of alum in the baking powder was instrumental in producing any disordered condition of the human system.

Q. You never conducted any tests or experiments yourself for the purpose of determining those questions? A. No, sir; none whatever.

Redirect Examination.

By Mr. Seddon: You were speaking of the effect that certain doses of alum would have. Did you consider in your answers what effect they would have when mixed with the food or when taken into the body as a part of the food, as against the administration as a medicine. A. Well, in administering alum as a medicine, it is administered in a solution or may be washed down in its own form. In that case it was given without any admixture at all.

Q. Suppose that the aluminum hydrate went into the stomach mixed with a large quantity of bread. Would that have any effect on the action that the aluminum would have? A. Yes, it certainly would have a very great effect. It is mechanical in its effect and if it was present along with

a very large quantity of food, bread for example, the chances are that it would have no effect whatever.

Q. Do I understand you to say that neither the alum nor its salts enter into the circulation? A. They do not enter into the circulation at all, they pass through without getting into the circulation.

Q. Then your testimony is that if a large quantity of bread or other food goes into the stomach along with the aluminum hydrate, being mechanical in its action, it is so interfered with that it passes through with practically no effect at all. A. Yes, sir.

Q. You say that alum is often administered as an emetic? A. Yes, sir; it is a very valuable remedy for that purpose. It will take care of itself either way in that it will be eliminated from the body either as an emetic and will come away with the vomiting, or it will pass through the digestive tract as a laxative.

Q. You stated, I believe, that it was used wherever an emetic might be used. A. Yes, sir; it is especially valuable in some cases of poison because, being mechanical in its effect, it does not have any tendency to increase the stupor, for instance the stupor that would follow the excessive use of some opiate.

Q. Did I understand you to say that ten grains would be regarded as a dose? A. Yes, if administered as an aluminum hydrate, even as low as six grains would be a dose.

Q. It is in evidence here that a loaf of bread contains eight to ten grain of aluminum hydrate when baked with an alum baking powder. Now I will ask you if a person would ordinarilly consume as much as a loaf of bread at a meal. A. It would be a most extraordinary man who would eat that quantity of bread at a meal. I would say that on an average they would not consume more than three, or at most, four slices at a meal.

Q. About how much would that be, what part of the loaf? A. One fourth of a loaf at most.

Q. So that the amount of aluminum hydrate that would go into the stomach as the result of the bread eaten at one meal would be about two and a half grains. A. Yes, sir.

Q. And that amount would be taken into the stomach mixed with a very large quantity of food—not only the bread

in which it was found, but the other food consumed at the meal. A. Yes, sir.

Q. What was the likelihood of you knowing if there had been any disturbance in the health or digestion of your family if it had been caused by the use of the Layton baking powder in the preparation of the food? A. We all partake freely of the same food, and if there had been any injurious effects it certainly would have manifested in more than one member of the family, and if I had detected any symptom that seemed to be common to all, it would have led me to believe there was something in the use of the alum baking powder, but I will say that there has never been any disorder of any kind that I could, in any way, attribute to that cause. We always take all of those things into consideration, and, as I stated before, nothing has ever come under my observation, and I know of no instances recorded in medical works where injurious effects have been attributed to the use of alum in the baking powder.

Q. Doctor, your inference, as far as it concerns your own family, is that it has had no injurious effect whatever and in your practice among your patients you have never been led to believe that any injurious effects resulted from the use of alum in the baking powder? A. No, sir; I never had a case that I thought in any way could be attributed to that cause.

Q. You spoke in your cross-examination of the medicinal properties of alum and hydrate of aluminum. Can you tell us what would be the effect of the use constantly of Rochelle salts upon the human system?

Objected to as incompetent because there is no testimony here that Rochelle Salts is one of the products resulting from the reaction of alum baking powder.

Mr. Seddon: We want to show that the continued use of large quantities of Rochelle Salts, one of the products resulting from the use of cream of tartar in the preparation of food, is just as injurious as the use of large quantities of the products resulting from the use of alum baking powders in the preparation of food. We claim here that baking powders are composed on the one hand of bicarbonate of soda and cream of tartar; and on the other hand of bicarbonate

of soda and soda alum. Now the legislature has arbitrarilly stricken down the use of the latter and we think it is fair to show that one is no more injurious than the other even in large quantities, and, in short, it would show that this is class legislation. They have undertaken to show that large quantities of alum used continuously would have a bad effect as it acts as a laxative and, in the same manner we have a right to show that large quantities of Rochelle Salts, if taken continuously, will produce effects equally injurious.

The Court: I will overrule the objection.

Plaintiff's counsel then and there excepted the ruling of the Court at the time.

A. It will have the same influence that sulphate of soda—Glauber's Salts would have. It is a purgative. Both are purgatives.

Q. I am asking you about Rochelle Salts. A. I say it would have the same effect as the Glauber's Salts. Both are purgatives.

Q. What are the effects of Cream of Tartar upon the system? A. Dieuretic, mainly.

Q. Will you please explain, in common terms, what you mean by Rochelle Salts having a diuretic effect? A. Your last question related to cream of tartar.

Q. I should say cream of tartar. A. By having a diuretic effect, I mean it acts upon the kidneys.

Q. Any other effects? A. It has a laxative influence.

Q. What effect, if any, would its continued use have upon the kidneys? A. Well, taken into the stomach, in any way in which it might be administered, the effect ordinarilly would not be very serious upon the kidneys. If taken in very large quantities it might produce an engorgement of those organs and its continued use would tend to increase its effect in that direction.

The Court: Do I understand by that that if administered in medicinal doses? A. Yes, if persisted in.

Q. Then one or two medicinal doses would not have that effect? A. No, sir; the question related, as I understood it related to its persistent use.

Q. What effect would the use of cream of tartar have upon the system of a child? A. That would depend entirely upon the dose. For instance, if you gave a six or eight grain dose to a child it would not have any effect upon its health, if it were a healthy child in the first place.

Q. It would have the same effect, then, as small doses of alum?

Objected to as leading.

Q. As compared with small doses of alum what effect would it have?

Mr. Cunningham: I am objecting to all of this line of testimony, and I understand the Court is taking it subject to my objection.

The Court: I so understood it. I will sustain the objection to the first question on the ground that it is leading, but Judge Seddon has changed the form of the question and in the present form the witness may answer it.

A. Small doses have entirely different effects upon the human body. You would have to give me the conditions.

Q. I am speaking of their injuriousness. A. Well, I know of no chemical effect that small doses would have. It is rarely, in fact never given in large doses as an emetic. In that quantity it takes care of itself. I do not know of any chemical effect that would result from the effect of small doses as it does not enter into the circulation. It would not affect the liver or kidneys or any of the organs of secretion, and I know of no way in which it would affect the organs of the body or any bodily functions.

The Court: Do I understand that alum enters into the stomach, when taken in ordinary medicinal doses, and there enters into compounds with the albumenoids and one of the results of that combination is hydrochloric acid? A. The introduction of alum into the stomach would have a tendency to form compounds with the albumenoids, but in ordinary medicinal doses that effect would not be observable, because it is taken in such quantities that it would act as an

emetic or laxative in which case it would quickly pass out.

Q. You say it does not enter into the circulation? A. No, sir; it only has a local effect.

Q. What is its local effect? A. Astringent, styptic, absorbant and protective.

Q. How do you mean? A. Well it has an astringent effect and by its styptic effect it would have a tendency to check any hemorrhages. It will form a coating and thereby protect the mucous membrane.

Q. I understood you to say it form some insoluble compounds? A. It would have a tendency to form insoluble compounds with the albumenoids.

Q. What would the resultant products be? A. Insoluble matter. If you rub it with the white of an egg it would give you a good example. It would form a curd.

Q. What are the chemical constituents of that curd? A. I do not know. All I can say is that if taken into the stomach it generally passes from the stomach either one way or the other, and its effect is merely local as far as has been ascertained.

Q. You spoke of its external use? A. Yes, sir; it is applied to burn or injuries of that character as an external application.

Q. Owing to its astringent properties would it have a tendency to check hemorrhages? A. Yes, sir.

Mr. Seddon: Do you know whether aluminum exists in the milk, in woman's milk? Is it there in any known form? A. I never heard of such a thing.

By Mr. Cunningham: Doctor, do you say that the compounds which the alum forms when it gets into the stomach is then and thereafter insoluble throughout the whole digestive tract? A. I didn't say so.

Q. You spoke of aluminum salts entering into compounds with the albumenoids of the stomach forming insoluble compounds. A. Yes, sir.

Q. Now, I ask you if you assert positively that these compounds which the alum will form in the stomach, which you say are insoluble, go through the alimentary canal in that form? A. It would be a reasonable inference. I have

had no practical experience with reference to those compounds, except the alum itself.

Q. Speaking of hydrate of aluminum, it is disolved by the action of the hydrochloric acid, now that being the case, would it afterward appear in any of the known forms of alum? A. That is not observable.

Q. How do you mean? A. I mean this, that if taken in any considerable quantity it passes out of the body without entering the circulation, and, for that reason, it is pretty hard to say just what takes place.

Q. Now doctor, you are aware are you not that Orfila found aluminum compounds after administration by the mouth, were found in the various parts of the body, such as the spleen and the kidneys? A. I cannot state that with reference to Orfila, but I can state that Wood and Stille discovered traces in the urine itself, but they never demonstrated how it got there. That is a matter of doubt, and in what form it got into the circulation, if at all, has never been determined.

Q. That is from Wood and Stille? A. Yes, sir; and I will say that the scientists who commented upon and criticised these matters have not determined how it got there, nor have they determined in what form it exists.

Q. You then have before you no practical results of their investigations. A. No, because they have never demonstrated how it got there. The alum might go into the stomach, but it would not be absorbed there.

Q. In the form of alum it must have disappeared and some new compound must have formed you think? A. Yes, the nature of which has not been determined.

Q. If it came in contact with hydrochloric acid, what is the result? A. It would be dissolved in hydrochloric acid, but I do not know what the product is, but I suppose it is simply a form, a hydrate or an oxide of aluminum.

Q. What would be the compound formed? A. I do not know.

Q. Do you know whether it would be an aluminum chloride? A. I do not know.

Q. Have you any inference? A. No, I do not know anything about it having made no experiments in that direction.

Q. Don't you know what the result would be from your general knowledge of chemistry and chemical reaction? A. No, sir; I do not know.

Q. If aluminum hydrate goes into the stomach and there comes in contact with the lactic acid, what in your opinion would be the product formed by the combination of these two substances? A. I never gave the matter a moment's thought. I do not know.

Q. Are you aware that hydrate of aluminum is soluble in lactic acid? A. Believe it to be in any dilute acid.

Q. So as a matter of fact the hydrochloric acid that goes into the stomach is liable to enter into compounds with any acids that it may find there? A. Yes, sir.

Q. Would it enter into compounds with any alkalines there? A. Yes, sir; it would be dissolved by the alkalines present, if not in the stomach below the stomach along the digestive tract.

Q. Now do you think that it is impossible that such substances as might be formed by a combination of the aluminum hydrate with these acids and these alkaline substances are necessarily insoluble? A. Well, they would not pass from the stomach into the circulation. I do not know what form they might take, but I know that they could not get into the circulation. I am speaking of alum in its own form of course. I am not prepared to speak of alum after it has undergone a chemical transformation.

Q. Then you do not say that it is impossible that chloride of aluminum in the stomach might not pass through the walls of the alimentary canal into the circulation? A. I am not prepared to pass an opinion on that subject.

Q. I asked you the same question I think about lactate of aluminum? A. Well, I make the same reply as to that.

Q. Now in regard to the statement made by Orfila. I asked you about that a moment ago and you said that you understood that the statements he made were correct, but that you derived your information on that point from some other writer? A. I did not get my information on that point from Orfila, but from Wood and Stille, and I believe Orfila's statement is correct, but they have never yet demonstrated the method by which these substances got into the urine because if they got into the urine they must have gotten there

through the circulation and they have never demonstrated how that was done.

Q. Orfila stated that it had been found in the spleen and kidneys. I will ask you if it could be found in the spleen and kidneys without going through the walls of alimentary canal and thereby passing into the circulation? A. It would have to pass into the circulation to get into the spleen and kidneys.

By Mr. Seddon: Now, he asks you some question about hydrate of aluminum which comes in contact with hydrochloric acid and lactic acid, etc.; do you know what combination it makes, with anything in the stomach? A. What is that?

Q. What combination that aluminum hydrate makes with anything in the stomach—does the stomach act like a beaker or not? A. Like what?

Q. Like a glass beaker? A. The stomach is a receptacle of a peculiar ferment and secretes a digestive agent; it has a physiological, or rather an anatomical movement, always in a certain direction, it secretes this fluid; it is, as a matter of course, a beaker in the sense that it holds a fluid or liquid, it is a receptacle for undigested material in order to transform it into an absorbent material which is readily absorbable and which enters into the building up of the tissues of the body.

Q. There are a great many other conditions in the stomach besides those presented by lactic acid, and hydrochloric acid, are there not? A. Yes, sir; there is a digestive ferment, pepsin; also it has this physiological quality of secreting mucus because it is lined with a mucous membrane.

Q. You spoke of hydrate of aluminum; do you specially precipitate hydrate of aluminum, and, if so, does hydrate of aluminum, which has been heated up to 212 degrees have the same properties and effect? A. I haven't the remotest idea, I never made any such experiment, nor have I ever read of one.

HENRY KREUTZBURG, sworn for defendant, testifies as follows:

Direct Examination.

By Seddon: What is your name? A. Henry Kreutzburg.

Q. What is your age? A. 55 next May the 23d.

Q. Do you live in St. Louis? A. Yes, sir.

Q. What is your business? A. Working for the Taylor Baking Powder Company.

Q. What do you do there? A. Mix the things for them and make flavoring extracts.

Q. How long have you been an alum powder mixer? A. 27 years.

Q. How much do you weigh? A. I weigh 158.

Q. Now, tell us what you do there in mixing the alum baking powder? A. We have a regular sifter, I weigh out my soda, burnt alum, starch, put them together in the sifter and mix it.

Q. What kind of packages does alum come in? A. Barrels, 355 pounds to 350.

Q. In mixing it what do you do with it? A. In mixing it up stairs—

Q. Do you take it out of barrels and put it in the mixer? A. We take a scoop and put it in the box and put it in the scale and weigh it in the proportion that we need.

By the Court: Is the alum ground or in lumps when it comes? A. It is ground.

Q. In the form of a powder? A. Yes, sir.

By Mr. Seddon: After you have mixed it in there what do you do with it? A. We leave it in a trough, we have a big trough, we leave it out and then shovel it up and put it in a barrel, roll it down to the elevator and we have got girls down there and they put it up in cans.

Q. Is there any dust? A. Oh Lord, the dust, you can hardly see anybody in there for the dust.

Q. That comes from this mixing. A. From the mixing of the alum, the soda and the starch.

Q. How many hours a day do you work? A. That depends on the orders, sometimes we have many orders, sometimes make 6,000 or 7,000 pounds a day. This mixing of powder, you couldn't see me in that, you wouldn't know there was anybody there.

Q. What has been the condition of your health during the years you have been working there? A. Well, the first three years I mixed cream of tartar baking powder, I got sick a couple of times, it made me sneeze and cough. Since they used alum baking powder—that time I weighed about 130 pounds, since I make alum baking powder I have increased my weight to 158, I have never been a week sick yet, maybe a day, but I never laid off a week yet in all them years.

Q. How is your appetite? A. I can eat four or five potatoes in the morning, like a base ball, or three or four eggs.

Q. Your health, then, I understand, has been good? A. Oh, pretty good, I can lunch about ten o'clock again.

Q. Do you belong to any benevolent societies? A. Yes, sir; I belong to two of them.

Q. How much have you drawn from these societies for sickness? A. I complained of being sick once, and when they came to see me I told them I was well again, I never drawed a penny yet.

Q. How many people work in that factory? A. I used to have, we were pretty busy at that time, 32 girls, but now, to-day, business is a little slack and we don't employ so many hands to-day; I used to make 7,000 pounds of powder a day.

Q. Do you have any helper in your mixing? A. Helper, yes, I have got a gentleman down there, he is about 65 years old, or 68, somewhere along there.

Q. As far as you have been able to observe, what is the condition of the health of people in that factory, as a rule? A. I have now ladies working for me fifteen years and they never was a week off steady, maybe a day sick, but I never complained that they was a week off. I have my own daughter down there that was never sick.

Q. How long has your daughter been there? A. Four or five years.

Cross-examination.

By Mr. Cunningham: What brand of baking powder do you make at your place? A. Make it "One Spoon" baking powder.

Q. Any others? A. And make "Two Spoons" baking powder.

Q. Do you put anything into it besides burnt alum and bicarbonate of soda and starch? A. No, sir; we don't put nothing else in; when we make a phosphate powder, we use phosphates that is all.

MAGGIE REGAN, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seddon:

Q. What is your name? A. Maggie Regan.
Q. Are you married or single? A. Single.
Q. Do you live in St. Louis? A. Yes, sir.
Q. What is your business? A. I work for Mr. Bain.
Q. What kind of work do you do for him? A. I label.

By the Court: You mean you put labels on baking powder cans? A. Yes, sir.

By Mr. Seddon: What business is Mr. Bain engaged in? A. Baking powder.

Q. What kind of baking powder, alum baking powder? A. Jack Frost, I don't know what kind.

Q. Is that alum baking powder? A. I don't know what kind of powder it is.

Q. Where do you label those cans? A. At Main and Elm Streets.

Q. I know, but in what room? A. What room?

Q. What part of the building? A. The second story.

Q. Is there anything mixed in that room? A. Yes, sir; mixed right there in the same room.

Q. Does any dust came from the mixing? A. Yes, sir; there is dust.

Q. That is dust from the mixing of the baking powder? A. Yes, sir.

Q. Can you give us any idea of how much of this dust is there in the room? A. No, sir; I cannot.

By the Court: Can you tell us how thick the dust is? A. Sometimes it is thicker than others.

Q. Well, about how does it average, how far can you see through it? A. You can see through it any time.

Q. The length of the room? A. Yes, sir.

By Mr. Seddon: Does it get on your clothing? A. Yes, sir.

Q. Do you have to wear any protection for your head? A. No, sir.

Q. How many hours a day do your work? A. From seven to five.

Q. Are you breathing that dust during that time? A. Yes, sir.

Q. I asked what protection you used to your head, do you wear paper caps? A. We wear paper caps, yes sir.

Q. To keep the dust off of your hair? A. Yes, sir.

Q. How long have you worked at this business that you describe? A. About eight years.

Q. What has been the condition of your health during that time? A. Very good, I have never been sick.

Q. How has your digestion been, and your appetite? A. Very good.

Q. You eat your meals regularly and heartily, do you? A. Yes, sir.

Q. Did I ask you how many hours of work were a day? A. Yes, sir.

Q. What is the general condition of the health of the employees that are doing the same kind of work that you are doing there, as far as you have been able to observe? A. All very good, I never knew of any to be sick since I have been there.

Q. Does your family use this baking powder? A. Yes, sir.

Q. In the preparation of their food? A. Yes, sir; we always use it.

Q. How long have you been using it? A. Ever since I have been there.

Q. How many years is that? A. About eight years.

Q. What is the general health of the family? A. Very good, they are all healthy.

Q. Have you been led to attribute any unhealthiness to the use of this baking powder in their baking? A. No, sir.

Cross-examination waived.

By the Court: Have you ever been troubled with catarrh or irritation of the throat? A. No, sir.

KATIE MAISSART, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seddon: Do you live in St. Louis? A. Yes, sir.

Q. What business are you in? A. I am in baking powder, putting baking powder in cans.

Q. Who are you with? A. Bain & Chapman.

Q. 120 S. Main street, St. Louis? A. Yes, sir.

Q. Do you work in the same room with Miss Regan? A. Yes, sir.

Q. What do you do in there and show us how you do it? A. Well, I take the baking powder out of the trucks and I put it in the box and then I put it in the cans.

Q. Is there any dust caused by handling this baking powder? A. Yes, sir.

Q. How much, how thick is the dust? A. I can see about until the end of the room.

Q. Does it get up on your clothes. A. Yes, sir.

Q. Do you have to wear anything on your head to keep it from getting in your hair? A. Yes, sir.

Q. Caps? A. Yes, sir; paper caps.

Q. How long have you been working there? A. Well, I was working there there a year and a half first, I am working there now six or seven months.

Q. What is that? A. I am working there a year and a half before now and I have been working there about six or seven months.

Q. Althogether you have been working there a year and a half? A. No, sir; it is altogether about two years and a month.

Q. What has been the state of your health during that period? A. I was very healthy.

Q. You have always looked as healthy as you do now, have you? A. Yes, sir.

Q. Well what has been your appetite and your digestion? A. Well, that has been fine.

Q. Have you ever had any sickness during that time you have been there? A. No, sir.

Q. Have you felt any inconvenience from this working there? A. No, sir.

Q. What has been your observation as to the health of the other employees working there with you in the same manner? (No answer.)

By the Court: Have the other people that worked in that room been as healthy as you have been? A. Yes, sir.

Cross-examination waived.

MOLLIE GIBBON, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seddon: What is your name? A. Mollie Gibbon.

Q. Do you live in St. Louis? A. Yes, sir.

Q. You work at Bain & Chapman's Manufactory? A. Yes, sir.

Q. What do you do there?

The Court: Judge Seddon, I suggest that as far as this line of testimony goes, the evidence of one person from each factory is just as convincing as all the cumulative evidence you may have.

Mr. Seddon: Then I will withdraw this witness, I think so myself. The witnesses were furnished to me.

The Court: It simply consumes time unnecessarilly.

Mr. Seddon: Do you wish to examine the witness, Major?

Mr. Cunningham: No, sir.

Mr. Seddon (To the stenographer): Please note there by the suggestion of the Court the witness is withdrawn and that one witness from a factory is sufficient—

The Court: The stenographer has the statement of the Court as he made it.

KATIE PRYSINGER, sworn for defendant testifies as follows:

Direct examination.

By Mr. Seddon: What is your name? A. Katie Prysinger.

Q. You live in St. Louis? A. Yes, sir.

Q. You are in business with Mr. Metzanaur, are you? A. Yes, sir.

Q. What is his business? A. Baking powder.

Q. Alum baking powder? A. I don't know whether it is alum or not, I couldn't say what kind of baking powder it is.

Q. What do you do there? A. Why I label and I fill, sometimes, the cans of baking powder.

Q. Is there any dust in the room arising from the mixture that you work in? A. Not from the mixture, but from the filling machine, there is dust.

Q. That is it arises from the machine that mixes the things that you girls put up? A. When the cans are getting filled, yes sir.

Q. Is there much then? A. Yes, sir; at times, a great deal.

Q. How long have you worked in that place? A. About 12 years.

Q. What has the condition of your health been during that time? A. Well, I am perfectly healthy all the time since I have been working there.

Q. You have been as healthy as you are now, have you? A. Yes, sir.

Q. How much time have you lost from sickness? A. I didn't lose any time from sickness.

Q. I mean from sickness; how is your appetite and digestion? A. I have a good appetite.

Q. How long do you work a day? A. I work from seven until half past five.

Q. Have you kept that up regularly? A. Yes, sir.

Q. How many people work in the same place that you do and under the same conditions? A. About six girls, five or six girls.

Q. What is the condition generally of their health? A. They seem to be healthy.

Q. Seem to be healthy and strong? A. Yes, sir.

Q. They work there the same hours that you do? A. Yes, sir.

Q. And in this dust like you do? A. In the dust, yes sir.

Cross-examination waived.

MARY QUINLIVAN, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seddon: What is your name? A. Mary Quinlivan.

Q. You live in St. Louis? A. Yes, sir.

Q. You work for Hanley & Kinsella? A. I am employed as forewoman there.

Q. What do they do? A. Put up baking powder and coffees.

Q. Their factory is in St. Louis? A. Yes, sir.

Q. What do you do there with them? A. I superintend the orders on baking powder, giving the girls their orders.

Q. How large a force do you work there? A. At the time, 17 or 18 girls.

Q. How long have you been there? A. Between 11 and 12 years.

Q. These are alum baking powders that they put up? A. I don't know anything about the mixing, it comes down after it is mixed.

Q. Is there any dust arising from the material, from the handling of it in your room? A. Yes, sir.

Q. Is that considerable or small? A. Well, it don't amount to much.

Q. It is sufficient to get upon your clothes? A. Oh, yes sir.

Q. The girls have to wear caps to keep it off their hair? A. They wear paper caps to protect their hair.

Q. What has been the condition of your health during the period? A. Well fairly good; at first, I was very thin, but it don't seem to effect my health any, I am getting stouter all the time.

Q. You are in good health now? A. Yes, sir.

Q. How is your appetite and digestion? A. Very good.

Q. How has it been generally during this period that you have worked there? A. This is the only place that I have ever worked in my life to amount to anything; it has always been good, I have never been sick to amount to anything.

Q. Have you ever observed any bad effect in any way from working there? A. Not upon myself, no sir.

By the Court: What kind of baking powder do you make in that place? A. I don't know anything about the mixing part of it, it comes down after it is mixed, all I know about it is after it is prepared.

By Mr. Seddon: What brand it is? A. We make four brands, we make U. S. A., what they call No. 2, Chartees, the H. & K. brand, and One Spoon.

Mr. Seddon: The H. & K. brand was analyzed by Dr. Kaiser.

The Court: There seems to be several one spoon brands.

Mr. Cunningham: This is at least the second one we have heard of today.

Mr. Seddon: I am informed that that is a common name for it, it goes by "One Spoon" of a particular manufacturer.

Cross-examination.

By Mr. Cunningham: What do these labels have on them? A. Well, all different labels.

Defendant's counsel states that he objects to this testimony on the same ground that he objected to the line of examination before; the Court sustains the objection.

Q. What is the name that Hanley & Kinsella put on the labels? A. On their own always, on their own powder, their own brand.

Q. I am speaking of the powder that was put up at your place? A. No, they have people that have their own name on it.

Q. So some go out from your place that have no name? A. They have the proprietor's name on it, if I own the baking powder, then it is my name, and if you own it, then it is yours.

Q. You mean the purchaser's name. A. Yes, sir.

Q. But not the name of Hanley & Kinsella? A. No, sir; that is not supposed to be on them.

Q. Then there would be a variety of names on the different packages that would go out according to who the purchaser was from you? A. Yes, sir; if you were the Scudder-Gale Grocery Company your name would appear on the baking powder.

Q. They are all of the same composition? A. Well, I cannot say as to that.

Q. Do you know of any difference? A. In some cases, yes, sir.

Q. Who does the mixing. A. A young man by the name of Lorenzen.

Q. Do you know anything about how he does it? A. No, sir.

Q. Do you know whether he mixes according to one formula for one powder and according to some other formula for some other powder? A. I know nothing about his business, whatever.

Q. Is there anything—you need not answer this question until the court rules on it, is there anything on any of the labels to indicate that the powder contains any alum?

Defendant's counsel states that he objects to the question on the same ground as heretofore; objection sustained.

LULU RIESS, sworn for defendant, testifies as follows:

Direct Examination.

Mr. Seddon: What is your full name? A. Lulu Riess.

Q. You live in St. Louis, do you? A. Yes, sir.

Q. You work with the Western Spice & Tea Co., don't you? A. Yes, sir.

Q. What do you do there? A. I paste out labels for the girls.

By the Court: Labels? For what? A. Baking powder.

By Mr. Seddon: You put up what is known as Layton's Quick Health Food, don't you? A. Yes, sir.

Q. Is there any dust in the room where you work coming from this mixture? A. Not from the mixture, but from the machine.

Q. Is there much dust? A. Not very much, once in awhile.

Q. Is there enough to get on your clothes? A. Yes, sir.

Q. You have to wear caps, don't you to keep it off? A. Yes, sir.

Q. How long have you been working at this business? A. At that place I have been working a year, one year.

Q. Did you work at this business anywhere else before that? A. Yes, sir; I worked at Metzenaur's.

Q. How long have you worked altogether at that? A. Two years and a half.

Q. Are you in good health now? A. Yes, sir.

Q. How is your appetite and digestion, do you eat well? A. Yes, sir.

Q. Eat full meals? A. Yes, sir.

Q. Have you been sick any time you have been working three? A. Once in awhile I was off a day, but not very often.

Q. Has your appetite been good, have you eaten heartily during that period as a general thing? A. Yes, sir.

By the Court: Does dust get into your nose and throat? A. Yes, sir.

Q. What effect does it have on you? A. It don't affect me.

Q. Does it make your throat smart, or has it any effect on your nose? A. No, sir.

Q. Do you breath the dust? A. Yes, sir.

Cross-examination.

By Mr. Cunningham: What baking powder is it that you make at the Western Spice & Tea Co? A. I don't know anything about the baking powder that they make.

Q. Well, you paste the labels on the cans, don't you? A. Yes, sir.

Q. What sort of labels are they, what colors? A. We have different colors.

Q. Some of them are what color? A. Some are white and red and blue and all kinds.

Q. You don't mean every possible kind, one is a blue color, isn't it? A. Yes, sir; blue and white.

Q. And then another is a reddish brown and white? A. Red, white and blue.

Q. And then what other? A. Some are all red.

Q. Is there any other variety that you think of? A. Some are white with gilt printing.

Q. As to the words or letters on them, are they all the same on the different colored labels? A. The directions?

Q. No, not the directions, but this Layton's Pure Health Food, or whatever the brands that are written on there to describe what the thing is, are those brands the same on all those labels? A. No, sir; not all.

Q. Can you tell me what are the words on any of them?

The Court: Do you mean the names of the brands?

Mr. Cunningham: Yes, your honor, for identifications. The purpose of this proof, I am frank to say, is this: Mr. Layton, in testifying said, as I understood him, that he had but one label, one brand, or one appearance of package, which was the one produced here. Now, I am frank to say, that I have found in the open market more than one and I have had some of them analyzed. I want to hear from one of the witnesses who puts them up as to how many different kinds or appearing packages are put up at that place.

Mr. Seddon: That testimony may have produced, Major, that impression on you, and, if so, we would like to have it corrected. Mr. Layton is here, and I am informed that they put up various brands, but that they also put up this brand that we have been charged with selling in the indictment, which we have admitted, and that was a uniform brand, and always put up in the same way; they do put up, I understand, several other brands, which they sell. I asked the witness about that particular brand.

Q. The Quick Health Food, that is one brand isn't it? A. Yes, sir.

By Mr. Cunningham: Layton's Quick Health Food, that is one of them? A. Yes, sir.

Q. Do you remember what is on one of the others? A. No, sir.

HENRY HEIMAN, sworn for defendant, testifies as follows:

Direct Examination.

By Mr. Seddon: You live in St. Louis? A. I certainly do.

Q. We are trying to get at the facts; you work whereabouts? A. At the Western Tea & Spice Co.

Q. What do you do there? A. I have had the mixing of baking powder for about a year.

A. What do you mix, what are the substances that you mix together? A. Starch, soda and alum.

Q. You put them into a grinding machine, or mixing machine? A. Yes, sir.

Q. And mix them up thoroughly, do you? A. Yes, sir.

Q. Is there any dust arising from that operation? A. No, sir.

Q. There is no dust in the room at all? A. No, sir; not from the mixer.

Q. I mean in the room where it is mixed, does it produce any dust? A. After it is put into the hopper there is dust.

Q. I mean to say that when it is put in the hopper, it creates dust, does it? A. Yes, sir.

Q. Enough to get on your clothes? A. Yes, sir.

Q. How long have you worked in that business? A. I say almost a year, about a year.

Q. What is the condition of your health and appetite? A. You can judge yourself.

Q. No, we are not trying this case for myself, we are trying it for the Court. A. First rate.

Q. Has it been the same all the time that you have been working there? A. Yes, sir.

Q. Your health is as good now as when you first went there? A. I think it is better than it was when I started.

Q. Have you had any trouble coming from breathing that dust that you can notice? A. No, sir.

Q. What is your observation as to the health of the other employees there who breathe the same air? A. I never heard any complaints whatever.

Cross-examination.

By Mr. Cunningham: You are a mixer there, are you? A. I was until a few months ago.

Q. How many different mixtures do you make, I mean by that how many different brands or sorts or kinds of baking powder do you mix or put up? A. Two.

Q. What are they called, what names do they go by? A. The Great Eastern is one.

Q. And the other? A. There is another put up for our customers with a label.

Q. What name does it go by. A. All names.

By the Court: Do you put any name that the customer wants on it? A. Yes sir.

By Mr. Cunningham: That is if John Smith is buying a lot of that powder you would put John Smith's name on the lable? A. Yes, sir.

Q. And this Great Eastern, that goes upon the powders that you do not put the names of customers on? A. No, sir.

Q. What powders does it go on then? A. That is a separate brand, Great Eastern only.

Q. What determines when you are going to put labels on the cans whether you are going to put on Great Eastern or whether you will put on the name of a customer? A. We don't put the Great Eastern powder up only for the Great Eastern Coffee & Tea Company.

Q. Who are they; is it a company here in St. Louis? A. Yes, sir.

Q. Where is there place of business? A. 1111 Franklin avenue and 417 Washington avenue.

Q. What business are they engaged in? A. Coffee and spice.

Q. That is, in other words, one of the special brands that you put up? A. Yes, sir.

Q. And you put up so much more for them than you do any other, is what you mean by saying that is a special brand? A. Yes, sir.

Q. Is the mixture made in exactly the same way and same proportions whether it is the Great Eastern brand or the brand of some special customer? A. No, sir.

Q. What is the mixture for the Great Eastern brand? A. Soda, starch, alum, albumen, magnesia and phosphate.

Q. And for the other than the Great Eastern brand, I mean the brand that is named with the names of customers, is that uniform, is the mixture uniform for the other? A. Yes, sir.

Q. What is that? A. Starch, soda and alum.

Q. In other words what you call a straight alum powder? A. Sir?

(Question read). A. Yes, sir.

Q. That is the name it goes by? And that is the class it goes by? A. Yes, sir.

Q. Now you are with the Western Spice and Tea Co.? A. Yes, sir.

Q. How many different colored labels do you use? A. I couldn't say.

By the Court:

Q. Do you have anything to do with the labels yourself? A. No, sir.

By Mr. Cunningham:

Q. You see the goods as they go out? A. Yes, sir; I see them; they have all the different colors.

Q. Do you know what the object and purpose of that is; having so many different colors? A. It is according to how they like them in different states I suppose.

Q. You mean that there is one color for one state and another color for another? A. No, sir; it is according to how the grocer orders it.

Q. You mean to say if you get an order from a grocer in Missouri for baking powders, that would determine the color of the label that you were going to put on these goods? A. Just whatever the customer wants.

Mr. Seddon: I want the Court to instruct the witness to——

The Court: The witness has answered, he said just whatever the customer wants.

By Mr. Cunningham:

Q. Do you know a label that has a yellowish brand, or reddish brown color goes on the brand of Layton's Pure Health Food; are you familiar with that label? A. A reddish brown?

Q. Yes; or brownish yellow; you are familiar with that label, are you (showing witness a can marked Exhibit A, January 2d, 1900, H. McW.) A. Yes, sir.

Q. Now are you familiar with the blue colored labels? A. Yes, sir.

Q. And can you tell whether there is any difference between the powders that are put up with those labels and the powders that are put up in the can with blue labels? A. No, sir.

Q. They are supposed to be the same, are they? A. Yes, sir.

EMIL METZENAUR, sworn for defendant, testifies as follows:

Direct examination by Mr. Seddon:

Q. What is your name? A. Emil Metzenaur.
Q. You live in St. Louis? A. Yes, sir.
Q. What is your business? A. Making baking powder.
Q. Where abouts? A. 211 S. 3d street.
Q. In St. Louis? A. Yes, sir.
Q. How long have you been engaged in that? A. 23 years.
Q. What kind of baking powder do you manufacture? A. Alum baking powder.
Q. Are you familiar with the trade in baking powder? A. Yes, sir.
Q. Have you been a large manufacturer during these years of these alum baking powders? A. Reasonably large; yes, sir.
Q. Where have you sold them to? A. Sold them in every state in the union.
Q. What satisfaction have these baking powders given to the trade? A. The very best.
Q. Have you ever heard of any complaint from the use of them? A. No, sir.
Q. Have you ever heard of any injurious effect produced upon the health and digestion of the consumer of the powders? A. I never have.
Q. Would you have been likely to have heard of it?

Counsel for the state objects.

Q. Would you have been likely to have heard of the fact if it existed?

Counsel for the state objects because it is for the Court to tell and not the witness; objection sustained.

Q. How large is your place of manufactory? A. How large is the place?

Q. Yes. A. It is a three-story building.

Q. How many people do you employ in that? A. Well, from 12 to 20; according to the season.

Q. Is there any dust in that manufactory arising from the mixture of the materials used in making the baking powders? A. Yes, sir.

Q. To what extent does the dust occur? A. It depends on the care of the operator; it lodges on everybody and everything; it is quite thick.

Q. Have you been breathing that air all the years you have been engaged in the business? A. Yes, sir.

Q. What is the condition of your health at present? A. It is pretty good.

Q. Very good, you say, is it? A. Yes, sir.

Q. How is your appetite and digestion? A. Very good.

Q. Have you any difficulty arising from the breathing of that air? A. No, sir.

Q. Troubled with your throat and nose? A. It stops up your nose, of course, when the dust is thick.

Q. Any chronic trouble? A. No, sir.

Q. A diseased condition coming from it? No, sir.

Q. Has your health been uniformly good? A. Yes, sir.

Q. What is the condition of the health of your employes who breath this air? A. It is generally good; it is normal.

Q. Normal, is it? A. Yes, sir.

Q. What bad effects, if any, have you observed either upon yourself or any other person who has been engaged in work in the factory? A. I have never observed any bad effects on their health.

Q. Now, these goods are put up in cans, are they not? A. Yes, sir.

Q. After they are packed in cans they are sealed? A. Yes, sir.

Q. And labeled? A. They are labeled; yes, sir.

Q. Will you state to what use that material in the cans and the cans themselves and the labels can be put if not sold as alum baking powder?

Mr. Cunningham: I object.

Mr. Seddon: One point we make is that the law is unconstitutional in this, that it makes no discrimination between the future and the past; that it absolutely condemns and confiscates the property in use. I wish to show that the property is of no use at all except to throw away if we cannot sell it in this business; it is utterly condemned and confiscated. If it was a horse and the law said we might not use him in a cart we might use him in a carriage. In this case there is an absolute confiscation. I could not say how your Honor will hold it, but we have produced authorities to the effect that if that is so the law is unconstitutional because it makes no difference between the past and the future. I do not ask your Honor to pre-judge the question at present. It is a serious question to be presented.

Mr. Cunningham: It is simply with the plaintiff as to how far we can limit this deluge of evidence——

Mr. Seddon: It is nearly through.

Mr. Cunningham: And keep yourselves within reasonable limits of the case. If what my friend has to say is admitted in toto we have lost sight of this case. This defendant, who is proceeded against for a definite thing under circumstances where the ownership of property at the time the law took effect is out of the question, proposes to show that if another man has property at that time that another man cannot be deprived of it. We have had enough of the decisions on this case that it does not do John Smith, who is indicted a bit of good to show that as to William Brown or some other man the statute might be unconstitutional if given a retroactive effect, that as to him it is none of his business.

Mr. Seddon: It does not make any difference whether it is this man or not.

The Court: The objection will be sustained at this time. There is no foundation laid for an investigation of this character.

Mr. Seddon: May I ask what foundation we ought to lay?

The Court: It is not contended in this case that the present case concerns anything in existence at the time of the passage of the law.

Mr. Seddon: We do not make any admission of that kind. You may not understand our position.

The Court: It has been frequently ruled that where a law affects vested rights it is unconstitutional to the extent that it interferes with those vested rights. That principle has been frequently declared, but even that same law has been held constitutional by the United States Supreme Court in a case that arose from the state of Ohio where the statute of limitations has been changed. The first law went up in a case where the statute of limitations had been changed after the going into effect of a contract and it was declared that the law could not apply and in another case a contract was made at a subsequent date and the supreme court held that the law did apply.

Mr. Seddon: I am not prepared to argue the point fully at this time; I think I can produce authorities to the effect that it is wholly unconstitutional as it does not make the proper discrimination.

The Court: I think not, I think to the contrary, that the law can be upheld by the courts so far as its application may be in constitutional limits, and it may be held invalid in other cases, as the Supreme Court of the United States declared in respect to the oleomargarine law of Pennsylvania.

Mr. Seddon: We have authorities to that effect and I wish to lay the foundation in the evidence.

The Court: The objection will be sustained as no foundation has been laid for it at this time. I examined the stipulation with reference to that fact at the time it was offered.

Mr. Cunningham: He is charged with manufacturing and selling after the statute took effect, to persons in the limits of St. Louis, for the purpose of use. We made a great point on the proposition that the vested rights were clearly excluded as well as all questions of interstate commerce.

Cross-examination waived.

PATTERSON BAIN, sworn for the defendant, testifies as follows:

Direct Examination.

By Mr. Seddon:

Q. What is your name? A. Patterson Bain.

Q. Where do you live? A. St. Louis—I reside at Ferguson.

Q. What is your business? A. Manufacturer of baking powders and grocers' sundries.

Q. What kind of baking powders do you manufacture? A. I make all kinds.

Q. What is the name of your concern? A. The Bain-Chapman Manufacturing Company.

Q. Do you put up what is known as alum baking powder? A. Yes, sir.

Q. How long have you been engaged in that business? A. Twenty-five or twenty-six years, twenty-seven, probably.

Q. Have you manufactured and sold it to any extent, a large extent? A. Yes, sir.

Q. In what portions of the country have you sold? A. Over the entire south and west, the east as far as Baltimore and north as far as St. Paul.

Q. What satisfaction have the alum baking powders you have sold given as a rule? A. Always given perfect satisfaction.

Q. What complaints, if any, have you heard? A. None whatever.

Q. Have you any idea of the extent generally in the United States of alum baking powders—you say you have been in business twenty odd years? A. Yes, sir; I think, having made an estimate from the best estimates I could, there was 100,000 pounds of baking powder sold last year.

By the Court:

Q. Alum baking powder? A. Yes, sir; of course, that is an estimate.

By Mr. Seddon:

Q. From your knowledge of the history of the trade can you state what satisfaction alum baking powders have given to the people? A. Always given perfect satisfaction. We have been making alum baking powders for fully twenty-five years; I made cream of tartar baking powders for several years before, all told twenty-seven years in business.

Q. I will ask you what brands you make? A. We make Bain's One Spoon, Jack Frost, Bouquet, Surprise and put up a number of brands with the buyer's names, for jobbers.

Q. Did you take any cans of alum baking powder to Prof. Keiser at any time? A. Yes, sir.

Q. At what time? A. I have a memorandum in my book, I do not remember the exact date, the 9th, I think it was of September, is my recollection. I have a memorandum in my book.

Q. Well, you never carried but one lot there? A. None but one lot.

Q. What brand was that? A. I took him up seven or eight brands that I purchased from the Moll Grocery Company.

Q. Where did you get them? A. At the A. Moll Grocery Company.

Q. Bought from the counter? A. Yes, sir.

Q. In the usual course of trade? A. Yes, sir; I paid for them.

Q. They were not selected in any way? A. No, sir.

Q. You bought them from the counter? A. Yes, sir.

Q. Just as a customer would do? A. Yes, sir.

Q. Have you used any baking powders in your family for cooking? A. Used it ever since I have been making it, twenty-four or twenty-five years.

Q. You commenced using them shortly after you commenced manufacturing them? A. Yes, sir.

Q. Have you ever observed any injurious effect that you could attribute from the use of alum baking powder on the health and digestion of your family? A. No, sir.

Q. They are good healthy children? A. Good healthy children and wife.

Q. What has been the condition of your health, uniformly? A. Very good.

Q. You look like a healthy person now? A. Yes, sir. I weigh as much or more than I ever did, I was never very stout.

Q. Are your appetite and digestion good? A. First rate.

Q. Do you ever suffer from indigestion? A. I never knew what indigestion was.

Cross Examination.

By Mr. Cunningham:

Q. Are the different brands of baking powder that you spoke of all made by the same formula? A. We make three kinds; have three formulas.

Q. What, substantially, are the components of the baking powder according to each of the three formulas? A. Soda, starch and alum with the addition of phosphate in the other.

Q. So the two different formulas by which you make two different powders contain only alum, sodium bi-carbonate and starch? A. Only two.

Q. How do they differ from each other? A. They differ in the amount of starch they contain; the amount of soda and alum is exactly—the exact proportion, the same proportion.

Q. One contains how much starch, and how much starch does the other contain? A. We have in the formula we use twenty pounds of alum and twenty pounds of soda and the balance starch. We have another formula that I use twenty-six pounds of soda I think it is, and twenty-six pounds of alum, making a little difference in the strength.

Q. You are not speaking in exact figures? A. Yes, sir; I am speaking in exact figures.

Q. Twenty-six pounds of alum to twenty-six pounds of bi-carbonate of soda? A. Yes, sir.

Q. Exactly? A. Yes, sir; and twenty and twenty.

Q. Who weighs that out? A. The man.

Q. And when he weighs it out if he is going to make it in one of the powders he weighs out exactly twenty pounds of

alum to twenty pounds of bi-carbonate? A. Yes, sir.

Q. And the other twenty-six to twenty-six exactly? A. Yes, sir.

Q. Do you know whether or not that gives a complete reaction of the alum and bi-carbonate of soda? A. I think it does, I examine it quite frequently and find it does.

Q. Is there not a general prejudice in the common mind against the use of alum baking powders? A. There is some prejudice which has arisen from the advertising being done.

Q. There is an effort to allay public apprehension about it, an effort on your part to allay that apprehension? A. We try to educate the people; yes, sir.

Q. What does that public apprehension seem to be founded on, what is the reason, what is the thing about alum baking powders that the people are apprehensive or have prejudice about? A. I think it is largely due——

Q. I ask you if you know what it is based upon as an assumed fact in the public mind? A. I will answer it, I think it comes from the fact that ages ago alum was used in England and possibly in this country for the purpose—bakers, I am told, and I think the prejudiced people, used crude alum to whiten the flour with nothing to neutralize it.

Q. You suppose, as I understand it, that the people imagined that the same harm would result from using alum baking powder as would result from the use of alum for whitening bread? A. They had been led to believe it by advertisements.

Q. You believe it is not so? A. I do not think it is so.

Q. And you think it important to convince the public that in bread baked with baking powders you will not find any alum? A. We offer $100 for any Rochelle Salts or alum found in our baking powder.

Q. With the Jack Frost? A. Yes, sir.

Q. You do not offer the reward for the other? A. I have not offered it, I may do it, I don't know; that is the only brand we advertise.

Q. That is the reason you advertise specially that you will pay a reward for either of the substances mentioned found in bread made with Jack Frost, that you do not advertise the other? A. No, sir.

Q. What do you suppose becomes of the alum that starts with the baking powder—you put the alum in the baking powder as you stated? A. Yes, sir.

Q. Twenty parts of alum to twenty parts of soda bicarbonate; what do you think becomes of the alum if it does not get into the bread? A. I am not a chemist. In my opinion it is neutralized and destroyed.

Q. But you do not profess to judge as to what the residuum is or what are the component parts after the alum has been decomposed? A. No, sir; I could not analyze it.

Q. It is not any part of your business? A. No, sir.

Mr. Seddon: I think I raised on the record very clearly the question I wanted to raise in reference to the constitutionality of the law, on the ground that it made no distinction between property in existence and that property which should come into existence. I did not take any exception to the ruling of the Court.

Mr. Cunningham: I understand that exceptions are saved to every adverse ruling on either side. This was the agreement on each side.

The Court: Yes, sir.

Mr. Seddon: And the ground of your exceptions.

Mr. Cunningham: That is all understood.

Re-Direct-Examination.

By Mr. Seddon:

Q. What are conditions with reference to dust coming from the mixing of baking powder in your factory? A. It is all over the whole floor; the whole building.

Q. And breathed practically by all the employes? A. Yes, sir. We cannot go there without getting our shoes all covered by it.

Q. What is your observation as to the general health of your employes during the time that you have been manufacturing baking powder? A. Perfect health; I have heard no complaint.

Q. So far as you have observed in good normal health? A. First rate.

Q. Have you any reason to infer that there is any deleterious effect produced on the health of any one in your factory? A. None whatever.

By the Court:

Q. You state that so far as your observation extends to the manufacture and sale of the alum baking powders in this country, it reaches a total of about 100,000,000 pounds per annum? A. Yes, sir; that is the estimate I would put upon it, figuring the different manufacturers and the amount of goods they put out.

Q. Have you estimated the total sales of all kinds of manufactured baking powders in the country? A. I have for my own satisfaction; I have not the data to go upon, but I would place the largest amount at about 20,000,000 pounds of other kinds.

Q. 20,000,000 pounds of other kinds? A. In pounds, not in dollars. It amounts to a large sum in dollars and cents because it is high priced. The other is cheap. 100,000,000 pounds of alum baking powders and possibly 20,000,000 pounds of the other, that is as near as I can estimate it.

Q. You leave out of your estimate any of the phosphatic baking powders? A. The alum includes that.

Q. Horsford? A. I did not include that; I include cream of tartar.

By Mr. Cunningham:

Q. You are giving facts? A. I base my knowledge of the trade going with the grocers, how much they have on hand, how much they sell and how much they carry in stock of each kind, that is one way of basing it, and the amount of material that is used. Of course there are a great many stores that use these baking powders altogether.

FRANK T. MASCHEK, sworn for the defendant, testifies as follows:

Direct examination by Mr. Seddon:

Q. What is your full name? A. Frank T. Maschek.

Q. Do you live in St. Louis? A. Yes, sir.

Q. What is your business? A. A retail grocer.

Q. How long have you been in business? A. Twenty years.

Q. Do you handle alum baking powders? A. Yes, sir.

Q. And have during all that period? A. Yes, sir.

Q. Have you sold them extensively? A. Yes, sir.

Q. In what portion of the country do you sell, all in St. Louis? A. Only in St. Louis; yes, sir.

Q. What satisfaction do you find that the alum baking powders that you have sold have given? A. Well, I never heard of any complaints.

Q. Have you ever heard of any complaints from any of your customers that these powders have injuriously effected the digestion or health in any way? A. No, sir.

Q. Then I understand they have given uniform satisfaction? A. So far as I know.

Q. Without inquiring minutely into your business, can you give us an idea of how extensively you have sold baking powders in the twenty years? A. We buy it every month in gross lots.

Q. And sell it almost every day? A. Sell it every day.

Q. There are calls for it? A. Yes, sir.

Q. It is quite universally used is it not? A. I should judge so from what we sell; we sell it every day.

Cross-Examination.

By Mr. Cunningham:

Q. You say you buy it every month and sell it every day? A. Yes, sir.

Q. Well, have you been buying it and selling it just as much since the law went into effect forbidding its sale as before?

Mr. Seddon: I object to that as not fair.

Mr. Cunningham: I submit that when a witness comes into court and undertakes to show to the Court that the business is going on uninterrupted by the laws of the country that I, at least, have the right to show whether it is so or not. In other words there is an appeal to the Court because there

is this great business interrupted arguendo, as a matter of fact we are to learn that this witness at all events does not care about the law. I want to see if it is so.

The Court: The matter rests with the witness.

Mr. Cunningham: If he makes the claim that his answer will incriminate him. I think it is for him to make it and not for the counsel.

Mr. Seddon: I think the Court ought to instruct him as to the possible effect of his answer so that he may judge.

The Court (to the witness): You have the right to answer the question if you choose or you may decline to answer it on the ground that your answer might tend to subject you to prosecution under this law.

The witness: What is the question?

(Question read). A. Have we?

Mr. Seddon (to the witness): You can answer it or not.

Mr. Cunningham: The Court has instructed the witness.

Mr. Seddon: I do not wish to interfere.

The witness: Have we been buying it and selling it the same?

Mr. Cunningham: That is the question.

The Court: The question is have you bought and sold alum baking powder as freely since the 20th day of August of last year as you did before that time? A. You say I do not have to answer?

Q. You are not obliged to answer unless you choose. A. I would rather not answer it.

By Mr. Cunningham:

Q. What alum baking powder did you buy and sell prior to the 20th day of August, 1899? A. What brands?

Q. Yes. A. Almost all brands, Jack Frost, Shepperd's, Bon Bon, Star, Grand, whatever the consumer demands we generally try to carry.

Q. When you say those are alum baking powders what do you mean? A. Only I understand they are.

Q. Are what? A. Alum baking powders.

Q. What is an alum baking powder? A. All I can say is what I suppose, that there is alum in it.

Q. You mean when you use that term the baking powder contains alum; is that what you mean? A. Yes, sir; I judge so.

Q. Do you not know what you mean? A. Yes, sir.

Q. Is that what you mean? A. That it contains alum?

Q. You mean that prior to August, 1899, you bought and sold the baking powders you have named and you understood that they contained alum? A. Yes, sir.

Q. That is what you mean? A. Yes, sir.

Q. What made you assume that they contained alum? How do you know they contained alum? A. Well, I don't know that they contained alum, I was only told they were alum baking powders.

Q. Did they state on the labels or anything marked on the packages the fact that they were alum baking powders or contained alum?

Defendant's counsel objects to this question on the same ground that they objected to the previous questions.

The Court: In this connection it is tending to show whether the witness knew they were alum powders or not. It may have some bearing.

Mr. Seddon: I cannot understand how it can have any bearing whether they were labeled or not. He knows it or does not know. He says he does not know except from what he is told; he is asked if they bore the name "alum" on the label.

The Court: The objection will be sustained from the fact a can may be labeled one thing or another.

By Mr. Cunningham:

Q. Who told you the baking powders contained alum? A. I don't know as I can say anybody in particular.

Q. Did anybody ever tell you that those powders contained alum? A. I may have been told so; I cannot remember.

Q. Did you ever tell the people to whom you sold those powders that they contained alum? A. No, I don't think I did.

Q. Why didn't you? A. I don't know as they asked the question.

By the Court:

Q. Where is your place of business located? A. One at 417 Morgan and another at 4617 Maryland avenue.

Q. What districts of the city do you cover with your sales? A. Go all over the city, north, south and west, no particular portion; go all over the city you might say.

Q. Do you deliver goods at the stores or by means of wagons? A. By means of wagons, and at the store, too.

Q. About how many wagons do you keep in operation? A. Five.

Q. Your trade is a retail trade? A. A retail trade.

Q. You state that it has been your practice to buy baking powders in gross lots; what do you mean by that? A gross of cans of each brand at a time? A. Yes, sir; each time.

Q. Have you handled any others besides alum baking powders? A. Yes, sir; handled Price's, Rumford's and Cleveland.

Q. What proportion do your sales of alum baking powders bear to your sales of other kinds? A. I should judge they were about equal.

Q. Sell about as much of one kind in weight or quantity as the other? A. On Morgan street—in the West End we differ; we use more Price's and Rumford's there to the others, at the West End store.

Q. How at the other store? A. More of the cheaper goods.

Q. Altogether you think you sell about as much of one kind as the other kind? A. Yes, sir; take it altogether, all around.

Redirect Examination.

By Mr. Seddon:

Q. What kind of people live in the different places, the various localities you have referred to? A. At 417 Morgan street, I don't know as we cater to the people that live there, because the people who trade there come from all parts of the city, north, south and west.

Q. People who live in the West End are usually people of a richer class? A. A richer class at Maryland avenue.

GEORGE HOMAN, sworn for the defendant, testifies as follows:

Direct Examination.

By Mr. Seddon:

Q. Give us your full name? A. George Homan.

Q. Do you live in St. Louis? A. I do.

Q. You are a doctor, are you not? A. A practicing physician.

Q. With an office in the Odd Fellows' building? A. Yes, sir.

Q. How long have you been engaged in the practice of medicine? A. Upwards of twenty-five years.

Q. How long? A. About twenty-five years.

Q. About twenty-five years, you say? A. Yes, sir.

Q. Has your practice been continuous? A. More or less continuous.

Q. Of what nature, general or special? A. General.

Q. Have you occupied any public position as a medical man? A. I have.

Q. State it if you please. A. Official positions, you mean?

Q. Yes, I mean those. A. I was a member of the State Board of Health for a number of years and Health Commissioner for a little short of two years.

By the Court:

Q. Health Commissioner for this city? A. Yes, sir.

By Mr. Seddon:

Q. Was that the Board of Health of the city or the State Board of Health? A. State Board of Health; also had the chair of hygiene in the medical department of Washington university, commonly called the St. Louis Medical college.

Q. You heard today the hypothetical case which I read to Dr. Merrell drawn from, as I stated, the deposition of Dr. Smith, did you not? A. I did.

Q. Had you ever heard read or read yourself that case before you heard me read it? A. I have read it; yes, sir, previous to today.

Q. You then have given the facts stated in there, which are rather complicated and difficult to understand on one reading, previous consideration, had you not, at my request? A. Yes, sir.

Q. Can you state from the hypothetical case, any conclusion, assuming it to be true, as to the effect, injurious or otherwise, which bread cooked with the powder used and described in that hypothetical case would have upon the health and digestion of mankind using it for a daily diet?

The Court: You mean the Layton baking powder?

Mr. Seddon: That is the one described, the Layton powder.

The Witness: That is the one mentioned.

Q. That is the one described in the hypothetical case? A. I am not able to see in what way it would be injurious to health.

Q. You cannot? A. No, sir.

Q. I do not fully catch your answer. A. I am not able to see that it would be in any way injurious to health or digestion.

Q. What conclusion would you draw with reference to the wholesomeness or unwholesomeness of that bread as a diet? A. I would say it would be a wholesome diet.

Q. Have you previously inspected any baking powder factory in the city of St. Louis and the employes therein? A. I have.

Q. What baking powder factory did you so inspect? A. I think on the 21st of January I visited the establishment of Eddy & Eddy, 500 N. Main and have been there several times since; the Taylor establishment on N. 2d, I think.

Q. What? A. The Taylor Manufacturing Company I think, the Taylor Baking Powder Company, whatever it is, I don't know the correct title; Bain's establishment——

Q. Bain & Chapman's? A. Yes, sir; the gentleman who testified this afternoon; and Mr. ———; I don't recall the name, on South 3d street; Hanley & Kinsella, on Spruce and 7th and Layton's place, 1000 Clark avenue.

Q. I will ask you whether the one you couldn't recollect was Metzenaur? A. That is the name; yes.

Q. Also Layton's? A. Yes, sir.

Q. Did you examine the employees who were working in these factories? A. I looked at them and talked with some of them.

Q. Which ones? A. I do not remember the names of the ones that I talked with; by referring to my notes, I can tell.

Q. Have you got them? A. Most of the employes were on the stand that I talked to at the place of business.

Q. Did you talk to the employes on the stand? A. This afternoon; yes.

Q. What conclusions did you draw with reference to the health of those employes having especial reference to their digestion and as to the effect, if any, the breathing of the atmosphere they describe had on their health and digestion? A. I was unable to see that their employment had anything to do with the condition of their health; that it in any way prejudiced it.

Q. Did you satisfy yourself, as a medical man, on that point? A. I am satisfied; yes, sir, so far as my observation went.

Q. Did you observation go sufficiently far to enable you to come to any conclusion? A. I think so.

Q. And you are satisfied then on that point? A. Yes, sir.

Cross-Examination.

By Major Cunningham:

Q. Doctor, if a patient was suffering from the effects of alum taken into the system by inhalation what would the symptoms be, what would you expect to find as indicating the trouble? A. It would probably be evidenced by an impaired condition of the digestive organs.

Q. What would be the specific symtoms? A. Do you mean take a person employed in that business?

Q. Yes, take it any way you want. If a patient was suffering from alum taken into the system by inhalation what would the symptoms be? A. I have no medical experience with alum.

Q. Have you never prescribed it? A. No, sir.

Q. Do you know what its effects on the person are? A. I have no experience in that direction.

Q. From your reading what is the effect of taking a quantity of alum into the system? A. Well, taken in a quantity it would act as an emetic.

Q. You mean by that that if taken in a quantity it would produce vomiting? A. Yes, sir.

Q. Well, what would be the effect if taken into the system by inhalation? A. Well, I have never had any experience of that kind.

Q. What symptoms would be disclosed by a diagnosis? A. I know of no symptoms that would be developed by the inhalation of alum.

Q. Then the substance of your answer is that if a patient was suffering from alum taken into the system by inhalation you would not recognize the symptoms at all, is that right? A. I do not know. I cannot conceive of such a case as you state.

Q. Is it not true Doctor that you would not recognize the symptoms as symptoms of that trouble? A. I am not prepared to state.

Q. Then let us take a case where the patient was suffering from alum taken into the stomach, what specific symptoms would you expect to find? A. I am not aware that specific symptoms would exist. The only thing is if alum was taken into the stomach in a large quantity it would act as a laxitive or would produce vomiting.

Q. Do you remember the sickness of Mr. Whitney Layton, the defendant in this case about the 22nd of last December? A. Yes, sir.

Q. Do you remember testifying in court on the 22nd of December that Mr. Layton was sick and in your opinion that it would not be safe for him to go into court for at least two weeks? A. I remember the circumstances; yes, sir.

Q. Are you prepared to say that he was not at that time suffering from alum poisoning? A. I expressed an opinion at the time as to the cause of his illness.

Q. Will you please answer the question? A. Will you please repeat the question?

Q. Are you prepared to state that he was not at that time suffering from alum poisoning? A. In my judgment he was not.

Q. How long after the 22nd of December was it before he recovered from the sickness sufficiently to enable him to go out and attend to his business? A. Well, when he did go out I will say it was against my advice, but I could not give the exact date.

Q. You say he went out against your advice? A. Yes, sir; but I don't remember the date.

Q. How long before the 22nd of December, or rather how long after the 22nd of December was it before he was able to be out? A. He did not observe my injunction.

Q. You were attending the case? A. Yes, sir.

Q. Wasn't it the next day or two? A. I should have to refer to my books, as I have no independent recollection on the subject.

Q. What is your recollection of the history of the case as to what time he was again out and about his business with reference to the time you testified here in court about it? A. It was not very long as I recall it, but I know he was not free from fever whenever it was.

Q. Well, about how long was it after the 22nd of December? A. It was Thursday that I was here, was it not?

Q. I cannot tell you what day of the week it was Doctor. A. Well, I am a little at a disadvantage in trying to answer your question, but he was out sooner than I thought best for him to go out. He did not obey my directions in that regard.

Q. Are you sure, Doctor, that he was not out within the next day or two? A. I would not be sure about that.

Q. Are you sure there was nothing about his sickness that would not indicate that he was suffering from alum poisoning? A. Well, there was certainly nothing to indicate that.

Q. What symptoms did you discover that you would say were not attributed to alum poisoning? A. Well, he had a very high fever.

Q. You mean, then, if a man was suffering from alum poisoning he would not have a high fever? A. I think I stated to you, Major Cunningham, that alum poisoning was something unknown to me.

Q. Then by whom—or rather, then by the symptom that he had a high fever you say that it would indicate he had not been suffering from alum poisoning? A. If you choose to put it that way.

Q. I am asking you. A. I never had a case of alum poisoning.

Q. But Doctor, in the practice of medicine you undertake to learn something about the proper way to treat a case or the proper way to diagnose a case before you are called upon to attend the case do you not? A. Certainly; we undertake to inform ourselves generally in regard to these matters, so that we ought to recognize a case if we saw it for the first time. We endeavor to get all the light we can.

Q. Then I ask you from your learning in the books or otherwise, would you say the fact that the man was suffering with a high fever was an indication that he was not suffering from alum poisoning? A. It never occurred to me there was any connection in that way. I do not know what you mean by alum poisoning.

Q. Will you answer the question. The question is whether the fact that a patient was suffering from a high fever would be taken as indicating, in your opinion, the fact that he was not suffering from the effects of getting alum into the stomach or into the circulation? A. I think I stated at the time that I thought he was suffering from the grip.

The Court: As I understand your testimony, there is no such thing as alum poisoning? A. It is certainly new to me. It is something unknown to me, and, of course, I would

not recognize the symptoms. In fact I do not comprehend what he means by the term alum poisoning.

Q. Are you familiar with the use of alum as a medicine? A. With the exception of the use of alum as a mouth wash I have never had any experience with it as a medicine—that is I have never prescribed it.

Q. You have never had occasion to prescribe it? A. No, sir.

Q. There are many substances known in the practice of medicine which you have not prescribed, are there not? A. Yes, sir.

Q. And, of course, as to the effects of these things you know nothing, of course, except what you learn from the books? A. Yes, sir; that is correct.

Q. Now, as a matter of fact, isn't it a medicine that is frequently used by physicians in the treatment of disease? A. I think it is used considerably in the treatment of disease, but it was used much more in the past than it is at present. It was in common use at one time, but it has fallen into disuse as a medicine at the present time.

Q. What are the therapeutic qualities of alum? A. As I learn from the books—emetic in large quantities and astringent in small quantities.

Q. Is it ever purgative? A. It is so stated.

Q. I understood you to say that it is an emetic in large quantities? A. Yes, sir.

Q. And astringent in small quantities? A. Yes, sir.

Q. And you say it is sometimes purgative? A. Yes, sir; it is so stated. I have never prescribed it and only know what I learn from the books or from others regarding its therapeutic qualities.

Q. I understood you to say that you use it in your practice as a mouth wash? A. Yes, sir.

Q. Now, then, in what quantities would it act as a purgative? A. Well, if it was administered in any considerable quantity, not enough to produce vomiting though, then it would act as a purgative.

Q. In what quantity would it have to be administered to produce vomiting? A. I am not prepared to answer that question now because I have paid no particular attention to it, never having had any use for it.

Q. Doctor, you have had this subject under consideration some little time have you not—the fact that you would be called upon to testify here? A. Yes, sir.

Q. And you have, therefore, had the subject matter of this controversy under consideration for some time? A. Simply in connection with this question of the use of the baking powder in connection with the preparation of food.

Q. Well, you have undertaken to express your opinion about the safety of the use of alum in baking powder, haven't you? A. Yes, I have expressed an opinion.

Q. Now, then, do you say that you cannot tell the Court what are the proper proportions in which alum is used as a medicine? A. No, sir; not from my own experience. I have stated that I never used it as a medicine.

Q. Now, then, Doctor, I understood you to say, or rather to express an opinion, that the use of alum in the way assumed in the hypothetical case is harmless? A. Yes, as I understood the case, it is.

Q. If you know nothing about the medicinal or therapeutic effects of alum how are you able to express an opinion here that the amount referred to in the hypothetical case is harmless? A. Because there was no alum in the bread as I understood it.

Q. Did you say that there was no alum in the bread? A. As I understood the case there was no alum in the bread.

Q. Did you assume that there was no alum in the bread as a condition precedent to the answer you made? A. I assumed there was no alum in the bread.

Q. Now, please pay attention to the question and we will get along a little faster. I shall be obliged to you if you will give me a direct answer to the question.

Mr. Seddon: There has been no disposition on the part of the witness to evade answering the questions and I submit that counsel has no right to examine the witness in that manner.

The Court: The witness may answer the question.

A. Does this question refer to the hypothetical case?

Mr. Cunningham: My question is did you assume that there was no alum in the bread, as a condition precedent to the

answer you made when the hypothetical case was put to you? A. I perhaps do not understand your question.

Q. Is the question not plain to you? A. I do not think it is complete.

Q. Do you remember the answer you made to the hypothetical question which Judge Seddon put to you? A. I do.

Q. What was it? A. I prefer to have it read.

Q. No I don't want that, I want you to tell us what answer you made to that question. A. I stated that as far as I could see that there was no injurious effects that resulted from the use of that bread.

Q. The use of what bread? A. The use of the bread mentioned in the hypothetical question.

Q. What bread was that? A. The bread prepared with the Layton baking powder.

Q. By whom? A. By Dr. Smith.

Q. Very well, now I ask you whether that answer you have just repeated is predicated upon the assumption that the bread contains no alum? A. That would be my opinion.

Q. It is not a question of opinion, doctor. The question is whether or not your opinion was based upon the assumption that the bread in that particular case as a sine qua non, as a condition precedent contained no alum? A. My opinion is that it contained no alum.

Q. Then if that condition is not true, that is to say, if it did contain alum then that bread was not wholesome or harmless was it? A. How is that?

Q. I mean if as a matter of fact that bread contained any alum do you still express the opinion that it was harmless and wholesome? A. I answered the question as it was put to me.

Q. I understand that, but I want to know upon what your opinion was based. I ask you now to reply to my question as I put it. A. I am not able to say. I am not able to say what the effect of the alum in the bread would be—as alum.

Q. You mean to say your answer to the hypothetical question would be the same whether there was or was not any alum in the bread? A. From my knowledge of alum I would say that if there was only a small quantity, very small quantity, my answer would be practically the same.

Q. Then as I understand the explanation, it is that you would say it would be healthy even though there was some small quantity of alum in the bread, is that correct? I am not prepared to say that there was any alum in the bread.

Q. Do you deny that there was any alum in the bread as a matter of fact? A. I understood that there was no alum in the bread.

Q. Of your own knowledge you do not know how it was prepared? A. No, sir; except the statement of Dr. Smith. I accepted that statement as true.

Q. What statement? A. His statement, or rather his description of the way the bread was prepared.

Q. Did you understand Dr. Smith to state positively that there was no alum in the bread? A. I think that is his statement.

Q. And you have assumed that statement to be true, and assuming the statement to be true and not otherwise, you expressed the opinion that the bread was wholesome. Is that a correct statement of your opinion? A. The question is rather involved, I think.

Q. I will get at it this way: Will you please explain what you mean by your answer to the Court just now when you stated that if there was a little alum in the bread your opinion would still be the same. Please explain the consistency of your answers. Your answer to me was that you assumed that there was no alum in the bread. Now in your answer to the Court a moment ago you stated that if there was a little alum it would make no difference. Will you please explain the consistency of those two answers? A. I have not deviated from my opinion that there was no alum in that bread.

Q. I do not think I understand your position at all, doctor. You have stated that you understood there was no alum at all in the bread and on that you based your opinion, now then you have stated to the Court that if there was a little alum in the bread your opinion would still be the same and that it would be healthy and safe to use. Will you please explain the consistency between your answer to my question and your answer to the question put by the Court?

Objected to on the ground that this is not the proper method of examining the witness and it is undertaking to bulldoze him and mislead him.

The Court: Answer the question, if you understand it.

A. I am not quite clear.

Q. You cannot answer the question then? A. I do not know whether I comprehend it or not, it is not clear to me.

Q. What is there about it that you do not understand? A. It is rather involved.

Q. As to what particular feature, phrase or clause is it involved?

The Court: Ask him if there was a small amount of alum in the bread.

The Witness: I did not admit that there was any alum in the bread.

The Court: Did you gauge your answer to the hypothetical question upon the constituents of the bread as reported therein, or from the results obtained from the experiment?

Mr. Seddon: As I understand the hypothetical question the chemical constituents of the bread were not referred to.

The Court: Let me have that hypothetical question and look over it.

Mr. Seddon: I am speaking of an analysis of the bread. No chemical analysis of the bread was given.

The Court: Let me get at it this way: Did you gauge your answer to the hypothetical question upon the constituents of the bread as given in the question or upon the results of the experiments as reported in the question? A. Upon both.

The Court: What effect in your mind did the fact have that there was reported as being used in the preparation of

that bread sodium alum, a sulphate of aluminum, as a constituent of that bread, if any? A. As I understood it, the sulphate of aluminum, or as we term it, the alum was put in there to assist in generating the leavening gas and after the chemical reaction has taken place the alum as such disappeared and was used in producing the carbon dioxide or carbonic acid gas which leavened the bread.

Q. Then in your answer to the hypothetical question did you not assume that there was no alum as alum present in the bread? A. It would depend, I think, upon the amount of alum.

Q. What amount would you fix as the dividing line? A. I am unable to state what amount. As I understood it that the alum as alum all disappeared in the process.

Mr. Cunningham: Suppose in making the alum baking powder twice as much alum is used as would be neutralized by the bicarbonate of soda, would not the reaction leave a residuum in the bread as free alum? A. I do not know.

Q. Do you not think it is a simple question as to what would be the chemical reaction between two substances so well known to chemists? A. It is a complicated question.

Q. How is that? A. It is a complicated problem.

Q. What is a complicated problem? A. As to whether a residuum of alum would remain in the bread.

Q. In case you mixed only half enough bicarbonate of soda or to put it a little plainer, in case you mixed only enough bicarbonate of soda to neutralize half of the alum what would the effect be? A. Mix them where and how?

Q. Any where? A. In the beaker or in the test tube or in the stomach?

Q. Anywhere so that you can get a chemical reaction. A. I am unable to answer that question because I am not a chemist.

Q. Do you know what chemical reaction takes place when sodium alum is mixed with bicarbonate of soda and the mixture is then wet with water? A. There would be the evolution of carbonic acid gas or carbon dioxide.

Q. Go on and explain the rest of the process. A. Well, if in the proper proportions they would neutralize each other.

Q. I want to know what, if anything, is left of those two substances? A. Of what substances?

Q. The alum and the soda. A. There would be probably an aluminum hydrate and a sodium sulphate.

Q. Do you know what are the chemical constituents of soda alum? A. It is a sulphate of aluminum and sod:

Q. What are the chemical constituents of bicarbonate of soda? A. Sodium and carbonic acid.

Q. Now, then, when the bicarbonate of soda is mixed with the sodium alum and the mixture is moistened, what chemical reaction takes place? A. I have never paid any particular attention to the chemical results but I understand there would be produced a sodium sulphate and another substance which I mentioned a while ago as an aluminum hydrate. I never saw that substance myself.

Q. Now then as I understand your answer the product of the reaction will be an aluminum hydrate and a sodium sulphate? A. Yes, sir.

Q. And free carbonic acid gas? A. Yes, sir.

Q. What is sodium sulphate? A. It is Glauber's salts.

Q. What has become of the alum? A. It has entirely disappeared.

Q. Now then, Doctor, what would take place if there was more alum than could be neutralized by the amount of bicarbonate of soda used in the baking powder? A. I do not know, as I never have paid any attention to those matters.

Q. You will observe the only change I have made in the question is to put in an excess of alum. Now can you not tell us, without going into the details of the chemistry what would be the effect if an excess of alum was used? A. No, sir; not from my own knowledge.

Q. Doctor I will ask you, then, if you do not know that the alum would remain there just as it was before the reaction took place? A. No, I don't know.

Q. You stated in answer to one of my questions that you had heard one of the products of the reaction spoken of as an aluminum hydrate, but that you did not know anything about it? A. I never heard anything about it until it came up in connection with this case. I made some inquiries at the drug stores as to whether it could be obtained and what it was and I was informed that it was never used by way of prescriptions—was not dispensed. I was desirous of familiariz-

ing myself, but I was unable to find it after having visited several drug stores for that purpose.

Q. Do you know anything about the medicial or therapeutic qualities of the article? A. No, sir; I do not.

Q. Do you know anything about whether or not if taken into the stomach as hydrate of aluminum and there comes in contact with free hydrochloric acid and sulphate of sodium it would not again take up some of the sulphuric acid and be reformed or regenerated into sulphate of aluminum in the stomach? A. I am unable to answer that question.

Q. You are unable to tell whether if it went into the stomach as hydrate of aluminum and there came in contact with the free hydrochloric acid and sulphate of sodium it would not be again reformed or regenerated into aluminum sulphate in the stomach? A. I am unable to answer that question.

Q. You say you do not know what are the therapeutic qualities of aluminum hydrate? A. No, sir.

Q. Do you not know that if as a matter of fact it was regenerated into a sulphate of aluminum it would exist there in the stomach and have the same effect as alum pure and simple? A. I cannot answer that question. I do not know.

Q. Those are questions necessary on which to base an opinion as to the injuriousness or wholesomeness of the baking powder when used in the preparation of food are they not? A. I rather think they are questions in physiological chemistry. They are such questions that a physiological chemist could answer then understandingly.

Q. I will ask you Doctor whether you think in view of what you have just stated about your knowledge of hydrate of aluminum you are sufficiently informed to give a proper answer, for the information of the Court as to whether bread in which hydrate of aluminum is contained is wholesome and harmless to eat? A. I do not quite understand your question.

Q. I ask you if you think, in view of your statements regarding your knowledge of hydrate of aluminum or to put it plainer your ignorance of the qualities or properties of hydrate of aluminum do you think you are competent to inform the Court as to whether or not bread which contained hydrate of aluminum as a product resulting from the use of the baking powder with which it was made is a wholesome and safe article of diet or otherwise? A. I have answered all the

questions except those relating to chemical matters and I disclaim any knowledge of the chemical properties or qualities of those things excepts in a general way.

Q. You disclaim any knowledge of what would happen if hydrate of aluminum goes into the stomach and there meets the sodium sulphate, free hydrochloric acid and lactic acid? A. I never heard of that matter until in connection with this case.

Q. You do not know what would happen if it got into the stomach in that way do you? A. I inquired for the purpose of getting some into my stomach and couldn't get any.

Q. Therefore you do not know anything about it? A. I admit my ignorance in regard to aluminum hydrate.

Q. I am therefore forced to the conclusion Doctor, am I not, that if you do not know anything about aluminum hydrate you are not able to give the Court a fair opinion as to whether or not bread which contains aluminum hydrate would be harmless or otherwise when taken into the stomach as a food? A. I stated under the conditions mentioned in the hypothetical question that I was under the impression that such bread would be wholesome.

Q. You say that you never heard of aluminum hydrate? A. I knew nothing about it.

Q. Then how are you able to state that such bread would be wholesome? A. I based my answer on the condition presented in the hypothetical case.

Q. You did not base your testimony on your ability as an expert chemist? A. No, sir.

Q. But as an expert physician did you not? A. As a medical practitioner and as a sanitarian.

Q. How it that? A. As a medical practitioner and a public health official.

Q. You say you haven't spoken as a medical expert? A. I have spoken as a practitioner of medicine and a health official at one time.

Q. As I understand your testimony on this subject it is to the effect that you have given no special attention to this question of aluminum hydrate? A. I stated that it was a new acquaintance to me.

Q. Then as an expert you do not claim to be able to tell the Court anything about the effect of the aluminum

hydrate when taken into the human stomach? A. I am unable to state what the effect would be.

Q. You are not able to state whether it is harmful or otherwise? A. As far as I have been able to discover it is harmless.

Q. You have no knowledge of your own on the subject? A. No, sir.

Mr. Seddon: I notice on reading Doctor Keiser's testimony given when we had the first hearing of this case along in January that there seems to be an error on page 117 where he undertakes to give the results of the analysis of the Jack Frost baking powder. If you will notice there he gives the total carbon dioxide and then goes on and gives the constituent elements of the baking powder. I think it is but fair to the Doctor as a man of science that he should go on the record properly and that he should be allowed to explain what might appear to his disadvantage and in that way affect the weight of his testimony, if the record is allowed to stand as it is.

Mr. Cunningham: I submit that the record states just what he said and I object to any corrections being made in his testimony at this time. I think if you examine the matter closely you will find that those tabulated statements explain themselves and there is no necessity for changing the record now for we have had careful experiments made based upon the statements therein contained.

The Court: I think it is a matter which is within the discretion of the Court and after examining the testimony as it is presented in the record I do not see any necessity for recalling Doctor Keiser at this stage of the case because to my mind the testimony is perfectly clear and I think I understand what he means by the statements he makes there. If further developements of this case should make it apparent to the Court that the Doctor was put at a disadvantage by the reason thereof I will exercise my discretion and give him a chance to make any explanation he may desire regarding those matters.

Mr. Seddon: I do not want to announce just yet that I am through with my case because we have another witness that I would like to call. He is not here now, but if an adjournment is taken I can produce him in the morning.

The Court: I shall expect you to close your case to-night and for that purpose will hold a night session.

Mr. Seddon: I could not get my witness here tonight.

The Court: Then we can proceed tomorrow with the plaintiff's testimony in rebuttal and if your witness comes in I will permit you to examine him when you can get him.

Mr. Cunningham: I should certainly object to that because we want to have them announce that they are through before we undertake our rebuttal testimony. I will have professor Mallett here to-morrow morning and expect to put him on the stand hoping to be able to get through with him to-morrow.

The Court: I will then consider the defendant's case closed unless you can get your witness and go ahead tonight.

Mr. Seddon: I will be unable to produce the witness to-night.

The Court: Then I will consider the defendant's case as closed.

At this stage of the examination an adjournment was taken until to-morrow, February 9, 1900 at 10 o'clock a. m.

On February 9, 1900, the Court met and the hearing of the case was resumed as follows:

Mr. Cunningham: If the Court please in the heat of the cross-examination yesterday of Dr. Homan, I inadvertently was led into the use of a tone and manner towards the witness which was very properly characterized by Judge Seddon. I desire now to express my regret for the heat and imprudence

into which I was led and I desire to make my apology to the Court and to Dr. Homan and counsel for my behaviour.

Mr. Seddon: It is heartily accepted by counsel. I am satisfied that Major Cunningham was betrayed by his zeal for his clients into that mode of cross-examination.

The State, to further sustain the issues on its part, offers evidence as follows:

Mr. Cunningham: If your Honor please, the State, in rebuttal, desires first to offer the following documentary evidence consisting of official reports of the Health and Food and Dairy Commissioners of several states, which the counsel for the defense has stipulated may be put in evidence subject to all other objections but without being authenticated by the signatures and seals of the secretaries of State and the seals of the states.

The first document which the State offers in evidence has been marked "1" and will be designated as plaintiff's Exhibit 1. It is an extract from the sixth annual report of the State Board of Health, Lunacy and Charity of Massachusetts and the part which is offered in evidence is found on page 137 and has been marked in red pencil.

Mr. Seddon: Before it is read we will say that we have no objections to the form in which the matter is presented, it is not an authenticated certified copy and we have waived that. We have consented that if certified and it was admissible we would not object to it on the ground of not being certified, but we do most strenuously object to the introduction of the material in the volume on the ground that it is utterly immaterial and incompetent, and I must confess that I cannot see on what ground it should be considered by counsel as relevant and material, and if he would be so good as to state the theory on which it is introduced so as to enable me to intelligently state my objections to the Court—

Mr. Cunningham: Briefly, the ground for the presentation of these documents, and especially of this one for the present, is that I understand the Court has so far received,

subject to the objections of the State, various opinions of learned men and experts and of some who do not profess to be experts, upon the proposition that while the use of alum in the preparation of food is expressly forbidden by the statute, yet it is in itself a thing harmless and innocuous to the public health and that this is a matter of such general common knowledge as to constitute this article and admitted generally received legitimate subject of barter and sale, so that in the contention of the defendant it is incompetent for the legislature of the State to interfere with the enjoyment of the right of manufacturing and selling this alleged well-known, universally recognized article of barter and sale and food. Now, as was stated by counsel for the State, when the defendant made tender of this sort of evidence, we objected because in our opinion it was a matter entirely immaterial to the issues in this case, which issues are simply and solely the guilt or innocence of this defendant of the charge brought against him. While that is true, yet, if the Court is to be advised upon matters of common knowledge, universal consent, undisputed right and universally recognized property, as was done in the Supreme Court of the United States in the Shellabarger case, the Court, when asked to take judicial notice of these facts, must reach out and see whether there is consensus of opinion and consensus of view upon the question whether or not this is a harmless, wholesome, legitimate subject of property and of sale. Now, how the Court is to get at that consensus of opinion and view any better than by the reports and proceedings of the officers in the several states who are charged with the care of this matter, charged with the care of seeing to it that the public health is not injured by the manufacure and sale of adulterated food or improper food, how the Court, I say, can get any better knowledge of what is a consensus of opinion on that point than by looking at official reports and records, I fail to see. I submit in that view and for that purpose it is perfectly competent and more competent than the expression of opinion by any merely private individual, however learned, or skilled or experienced he may be. That is the theory upon which the documents are offered.

The Court: You offer them on the theory that it is an expression of opinion by persons or authorities respecting the use of this or similar preparations in food articles?

Mr. Cunningham: Yes, and besides, if the Court please, there is in part of the defendant's evidence a statement of one of the witnesses, Dr. Smith, that the innocuousness of this thing is a matter of common knowledge, and your Honor has heard, both by that witness and by others the citation of authorities upon that proposition.

The Court: The extent to which the Court has received evidence is this, first the Court has undertaken to receive evidence on the fact whether or not alum baking powder is an innocuous or harmful thing, and second as to the manner in which it is regarded by persons who have knowledge of the subject. Now, upon these matters, of course, evidence as to the direct fact by experiments and the action and use of the article in question affords a guide to the court. The opinions of experts, based upon general knowledge, observation and reading and, perhaps, experiments that they themselves have conducted, are of value to the Court, but only when presented on the stand and subjected to examination and cross-examination, so that the foundation upon which their opinion rests may be examined and analyzed so that the Court may know what value to give to their testimony and opinions. The mere expression of opinion by some state board without anything to reveal the circumstances and conditions under which that opinion was arrived at, or the basis upon which it was founded certainly could not avail this Court anything. The fact that some state board had said something to somebody would not affect my judgment a particle, I would have to know what evidence was before them and what were the conditions they founded their opinion on. The mere fact that they had an opinion would be of no more weight than the statement that a Court at some place had decreed the title to a certain piece of property. I would have to know the condition of the record and the questions involved to determine for myself whether the opinion was correct. I think the opposing side has the right to analyze and criticise the opinions of ex-

perts upon matters of that nature, and for that reason the privilege of cross-examination is afforded.

Mr. Cunningham: Of course if it were a matter of ordinary issue and proof as an ultimate fact in the case I should not stand here and ask to do it. It is only in the light of the Shellabarger case where the Judge who rendered the opinion said he would go out and look into magazines and treatises and find out what, if any, was the consensus of opinion on the subject. That is my only authority for making the tender.

The Court: The objection will be sustained. You may make the formal tender.

Mr. Cunningham: Then I make the tender of that particular part of the document marked Plaintiff's Exhibit 1, which is found on page 137, marked in red pencil, and, as it is very brief, I will read it to the stenographer so that he may get it down.

Mr. Seddon: I object to it going into the record in any way. Let him identify it by saying it begins on a certain page with such a line and ends with such a line.

Mr. Cunningham: It has to be copied at some time and it is a matter for the indulgence of the Court.

The Court: Read it.

Mr. Cunningham (reading):

"Baking Powders and Cream of Tartar."

"These two classes of preparation, and particularly the latter, are subject to very extensive adulteration.

"The competition existing among the manufacturers of the better brands of baking powders insures purity to a considerable extent; but the numerous cheap articles, the sale of which is promoted by the presentation of cups and saucers, tin spoons and other table ware, chromos, etc., etc., are always suspicious and should be avoided on general principles. The cheaper baking powders are more likely to contain alum than

cream of tartar; the latter substance is the acid salt which is most commonly used in the manufacture of the better brands. I examined five of the cheaper brands and found one to be composed of cream of tartar and bicarbonate of soda, one of the latter substance with acid phosphate, and three of alum and bicarbonate of soda. The latter were condemned as unwholesome, since the weight of evidence on the subject is to the effect that alum is not a proper substance to be used in the baking of bread."

The second document tendered in evidence are extracts from the Report of the Dairy Commissioner of the State of New Jersey, for the year 1888, found on pages 5, 53, 54, 57, 60, 63, 91 and 92, all of which are marked in red pencil, and will be designated as Plaintiff's Exhibit 2.

"Notes on the Baking Powders Sold in This State.

"Samples of nearly all of the different brands of baking powders—

Mr. Seddon: If your Honor please, may I ask whether it is necessary to take the time of this Court, consume the time of this Court and whether it is necessary to inject into this case by reading all of this immaterial matter necessarily tending to prejudice more or less in every respect possible, without aiding or assisting in getting at a solution of the real merits of the case? Does not a rule of Court provide some way by which the offer can be made, tendered and identified? Is it not within the discretion of the Court whether that shall be done or not? I think certainly in a case of this kind it ought to be done.

The Court: If the extracts are very short they may be read so that the stenographer may take them and if lengthy they may be identified.

Mr. Cunningham: There is only one of them of any length.

Mr. Seddon: There is a page or two pages of matter that can be referred to and identified.

Mr. Cunningham: That is the longest of any of them. Several of them contain only a dozen lines.

Mr. Seddon: That can all be identified and offered in evidence.

Mr. Cunningham: It seems much better with a record of the volume that we are likely to have that we should take the time now to do this if the Court will be indulgent so that the matter can be done forever. Of course I understand that it is a matter of indulgence with the Court.

The Court: You may proceed.

Mr. Cunningham (reading):

"Notes on the Baking Powders Sold in This State.

"Samples of nearly all of the different brands—

Mr. Seddon: Is that the long one that you can offer by reference?

Mr. Cunningham: I understand it is a page and a half. (Reading.)

"Notes of the Baking Powders Sold in This State.

"Samples of nearly all of the different brands of baking powders for sale in this State were purchased and sent to Henry B. Cornwall, Ph.D., Professor of Analytical Chemistry at the John C. Green School of Science, Princeton College. He was requested to make the necessary analyses to determine the ingredients of the powders, to ascertain the leavening power or strength of each, and to report on the character of the substances used in their composition, with especial reference to the healthfulness or otherwise of the residues left in the bread after baking. It was at first intended to make a special inquiry regarding these residues, and to make tests of the powders by preparing a portion of bread with each. But the expense and time necessary to carry on this elaborate and costly series of experiments have been spared us, as Professor Mallet, of the University of Virginia, has recently completed an investigation in this very line of work, hence, it is only necessary to refer to his report for information con-

cerning this branch of the subject. His paper is quoted liberally in Professor Cornwall's report; it may be read in full in the London Chemical News for December 7th and 14th, 1888.

"The opinions given in the report of Professor Cornwall are based on some 55 analyses of 39 brands of baking powders, as follows:

	Analyses.	Brands.
Cream of tartar and bi-carbonate of soda powders	13	8
Phosphate of lime and bi-carbonate of soda powders	7	4
Alum, phosphate of lime and bi-carb. of soda powd.	26	20
Alum and bi-carbonate of soda powders	6	4
Unclassified	3	3

"His report, and the analyses accompanying it, constitute an extremely valuable and impartial contribution to the literature of the subject, besides being of great importance to all who use baking powders. A careful study of his paper is recommended, as one can thereby be the better qualified to form an opinion on the relative healthfulness of the different brands of powders, and be prepared to accept or disprove the biased statements put forth in circulars and advertisements issued by manufacturers. Comparing the deductions given in that report, which are founded on experiment and scientific investigation, with the mere bald statements of advertisers, will show the consumer which is correct.

"As was stated, each sample submitted to analysis was purchased at retail in this State, by myself or one of my agents; each package was in its original form, and the seals and wrappers were undisturbed when delivered to Professor Cornwall. The greater number of the inferior grades of baking powders were only to be had at stores patronized by poor people, or those of moderate means, hence we are forced to believe that any fraud in these articles is perpetrated at the expense of those least able to bear it. Many of the brands had no name of manufacturer or maker on the package; these were almost invariably of very poor quality, and containing ingredients of doubtful salubrity.

"Another point worthy of note is, that large quantities of inferior baking powder are sold in bulk by manufactures. This is put up in boxes by the retailer and a fancy label af-

fixed, he knowing nothing about the composition of the substance—its cheapness only concerning him."

Mr. Seddon: I wish to renew my same objection and call your Honor's attention to the fact that after hearing the proposed offer your Honor said that was evidence incompetent and immaterial in the case. Your Honor sitting as a jury in the case rules that it is not competent and not material and yet it shall go to the jury anyhow. Of course I know very well your Honor has a well trained mind and you are capable of disassociating impressions from the legal quality of evidence. A great many lawyers frequently can do that. We are arguing the propriety of the jury hearing the evidence at all. It ought not to hear the evidence. It ought not to run the risk of its affecting the mind of the jury. Certainly if a jury were here your Honor would not allow the thing to be read in its presence. I submit that it can be reached with entire compliance with the rules of law by simply offering it and identifying it in such a way as cannot be mistaken as is done in every court. No court sits and hears the details of evidence, which is only offered for the purpose of identification when it can be identified properly. I do think it is my duty to my clients to pray your Honor to reconsider your decision on this ground.

The Court: My ruling was made with a view of saving time if possible, that it would be a better and quicker way to have the extracts read. I am paying no attention to the extracts and would not.

Mr. Seddon: I am not referring to your Honor at the present time, I am referring to the way of introducing testimony.

The Court: I shall continue my correspondence until the reading is over and then resume the hearing of the case.

Mr. Cunningham: On page 57 (reading.)

"The manufacture of powders composed on the one hand of cream of tartar and bi-carbonate of soda, and on the other

of acid phosphate and bi-carbonate of soda, went on for years, and the product was considered healthful under certain circumstances and when used occasionally. The high price of the cream of tartar led some manufacturers to try other articles that would act on the bi-carbonate of soda and liberate the carbonic acid. And soon powders containing alum, in one or another form, as the acid element, appeared on the market, the proper inquiry as to the healthfulness of the substance or its action on the digestion not being at that time instituted, or before the introduction of the new preparation, the sole element of cheapness obscuring all other questions for the time. Of late years this question has been raised, and the discussion is quite amply noted in the report of Professor Cornwall."

On page 60 (reading): "The residue from the alum powders depends on the form of alum used, and also on the solubility of this residue in the fluids of the body. It is now conceded that a portion of these alum residues is soluble in the gastric juice. Pitkin (Jour. Am. Chem. Society, Vol. IX, No. 2), states that he thinks that at least one-sixth of the residue is soluble in the stomach and mouth. Mallet (Chemical News, Dec. 7 and 14, 1888), states that a part of the aluminium unites with the acid of the gastric juice and is taken up into solution, while at the same time the remainder of the aluminium hydroxide or phosphate throws down in insoluble form the organic substance constituting the peptic ferment.

"This evidence is conclusive and certainly points to those facts: that alum residue does affect digestion, and that these residues are more or less soluble and are carried into the system. Hence, it is suggested that if any person wishes to avoid a possible danger to health he should refuse to buy alum powders. It must be stated, however, that the evidence in the case is not as strong as with other chemical agents, and we cannot speak of the results following the constant ingestion of small quantities of the soluble alum compounds with the certainty that we do when considering lead and other toxic agents, which are poisonous when taken in very minute quantities and continuously.

"All that I can do officially, while there is yet doubt on this question, is to give the public the benefit of that doubt,

and advise the use of these preparations with great caution until the problem is positively settled by experiments on the lower animals. As will be seen by reading Professor Cornwall's paper, some alum combinations are known to be dangerous to health; these he has indicated."

On page 63 (reading):

"Composition and comparative healthfulness of the baking powders sold in this State. By Henry B. Cornwall, Ph.D., Professor of Analytical Chemistry—

Mr. Seddon: You are reading the opinion of another man?

Mr. Cunningham: I am reading the report of Professor Cornwall embodied in the Report of the Dairy Commissioner and expressly referred to by him.

Mr. Seddon: That is the opinion of another man. I wish to renew my objection on the same ground. This case has been protracted and drawn out to a considerable extent and your Honor has considered it necessary that we should have night sessions.

The Court: I have ruled on the point repeatedly and I will not rule again. Please do not interrupt me.

Mr. Cunningham (reading):

"COMPOSITION AND COMPARATIVE HEALTHFULNESS OF THE BAKING POWDERS SOLD IN THIS STATE.

By Henry B. Cornwall, Ph. D., Professor of Analytical Chemistry, John C. Green School of Science, Princeton College.

"Introduction.

"Although nothing is so well adapted as yeast for making a palatable and digestible bread, yet their greater convenience or the necessities of the case may sometimes be a reason

for using baking powders even for making bread, and they are very largely used in preparing various articles of food which largely take the place of bread. It becomes, therefore, a very important question to determine the probable effects of the many different kinds of baking powders on the health of the consumers.

"With this object in view, the investigations described in the following pages have been undertaken by the writer, at the request of the State Dairy Commissioner. All of the samples herein referred to have been bought in open market, and were sent to the analyst by the Commissioner or his assistants."

On pages 91 and 92 (reading):

Conclusions.

"Our investigations show that while especially the higher grades of cream of tartar and acid phosphate of lime powders are maintained at a quite uniform standard of excellence, the State is flooded, also, with many baking powders of very poor quality—cheap goods, poorly made. Of the thirty-nine brands examined, twenty-five contain alum or its equivalent, in the shape of some soluble alumina compound; eight are cream of tartar powders, with small quantities of other ingredients in several cases; four are acid phosphate of lime powders; two belong properly under none of the above classes.

"With one exception, the powders containing alum all fall below the average strength of the cream of tartar powders, and in the majority of cases they fall much below the better grades of the cream of tartar powders.

"In the cream of tartar and the acid phosphate of lime powders, no indications of substances likely to be injurious to health, in the quantities used, have been found.

"More evidence against the use of alum in baking powders might have been presented, but it would have been of a similar nature to that which has already been given. In the writer's opinion, the presence of alum in baking powders is objectionable, since, under certain conditions, it may exert an injurious effect on the digestion. The effects may not be very marked, in the case of any individual consumer, but

that they can be induced to a greater or less extent, seems to be well established."

We next make the tender of extracts from the First Annual Report of the Ohio Dairy and Food Commissioner to the Governor of the State of Ohio for the year 1886, which will be designated as Plaintiff's Exhibit 3, the part offered being found on page 31 and marked with red pencil.

Mr. Seddon: I renew my objection on the same ground.

Mr. Cunningham (reading):

"Baking Powder.

"Baking powder should consist of a mixture, in proper proportions of sodium bicarbonate and cream of tartar, or, as in the case of the Horsford baking powder, of an acid phosphate. An admixture of not more than 10 per cent. of starch is also admissable, as this tends to prevent the substances acting upon each other while in the market. The value of a baking powder depends upon the amount of carbon dioxide which is evolved when it is moistened with water, as in baking. In the examination of five samples of baking powder collected at grocery stores, the amount of carbon dioxide evolved varied from 7.72 per cent. to 11.3 per cent. The greatest evil in connection with baking powder exists in substituting alum for cream of tartar. This criminal practice is carried to a much greater extent than is ordinarily supposed. If the Dairy and Food Commission should succeed in driving from our State even this one article of daily consumption—the alum baking powder—the people of the State would be amply repaid for the whole cost of the commission."

The next document offered is extracts from the Sixth Biennial Report of the Minnesota State Dairy and Food Commissioner, marked in red pencil on pages 115, 116 and 118, which report is designated as Plaintiff's Exhibit 4.

Mr. Seddon: We object to that on the same ground as before.

The Court: The same ruling.

Mr. Cunningham: From pages 115 and 116 (reading):

"Alum Powders. A large amount of evidence relating to the harmful nature of alum powders is given in the fourth and fifth biennial report of this commission, to which those interested are referred. Two things may be said to have been proven:

"First—The aluminium present in alum powders remains in the bread as the hydrated salt.

"Second—This salt is to some extent soluble in the digestive juices.

"The toxic effects of the soluble salt and its influence on the efficacy of the digestive juices have not until lately ben demonstrated. Indeed there is still room for more experimental work along these lines.

"Mr. Hehner, by artificial digestion experiments (Analyst; Vol. VII), finds that aluminium hydrate has as marked injurious effect upon the digestibility of bread, milk and eggs as has alum. Less effect was noticeable upon the digestibility of raw flour. From another standpoint he tested the effect of alum by dissolving in water as much baking powder as would constitute a maximum dose in bread. This he drank and gave similar draughts to his assistants. All complained of decidedly uncomfortable if not injurious consequences as a result of these experiments, he arrives at the following conclusion:

"That alumed baking powder exerts most injurious effects upon digestion, whether artificial or in the body; that the presence of alum in baking powder must be regarded as an adulteration injurious to health; that samples containing alum should be condemned as injurious, even though magistrates and recorders declare alum to be quite harmless; and that the sodium bicarbonate contained in the baking powder does not neutralize the objectionable qualities of the alum.

"It is claimed that these experiments do not justify the conclusions, on the grounds: First—That only gastric digestion as effected by pepsin was represented, while other juices, notably pancreatic, participate in digestion. Second—In the natural digestion experiment the baking powder was taken alone and unnaturally. If compressed in dough or bread,

as in actual use, it is reasonable to suppose that its action would be less severe.

"Dustan finds that aluminium hydrate in bread interferes with the action of diastas (hence with ptyalin, the digestive ferment of the saliva), and with peptic and pancreatic digestion; also, that a three per cent. solution of sodium carbonate (the strength of alkali in intestinal juice) will dissolve aluminium hydroxide dried at 100 Centigrade. He also claims to have found an aluminium salt in the urine of a man who had eaten one or two grains of aluminium hydroxide dried at 100 Centigrade.

"Dunstan, Hehner, and Thompson claim that their experiments prove aluminium hydroxide dried at 100 Centigrade to be soluble in two-tenths per cent. hydrochloric acid. This amount of acid is generally accepted to be present in gastric juice. Sutton and Suff, on the other hand, affirm that aluminium hydroxide is not soluble in gastric juice; one being led to this conclusion by experiments with a dializer and the other by the action of a very dilute solution of hydrochloride acid (two hundredths per cent., which he regards as the amount present in gastric juice), upon aluminium hydroxide dried at 150 Centigrade. This temperture is certainly higher than the interior of bread in the oven, and probably changes a portion, at least of the hydroxide into oxyhydroxide."

From page 118 (reading):

"Bigelow and Hamilton, in the classic experiment above referred to, conclusively prove that aluminium phosphate, even in the quantity found in bread baked with alum phosphatic powder, is very detrimental to peptic and pancreatic digestion. While aluminium hydroxide in small quantities has an effect on peptic digestion equal to alum, in larger quantities it is not so severe. With alum phosphate even a large amount has as great a retarding effect as the same amount of alum. In stating their conclusions upon this phase of their investigation the authors say: 'From these results it appears that the influence of aluminium hydroxide on the digestibility of bread is about the same as an equivalent quantity of alum when present in about the quantity which is usually found as a result of the use of alum baking powder which contains no phosphate'."

The next document will be extracts from pages 8 and 9 of a Report to State Dairy Commissioner upon Food Adulterations in Minnesota, by Charles W. Drew M. D., Ph.D., which is designated as Plaintiff's Exhibit 5.

Mr. Seddon: We renew our former objection as made to the others.

Mr. Cunningham (reading):

"Relative to the healthfulness of Alum baking powders the most diverse opinions have been expressed by eminent physicians and chemists. Pure alum is unquestionably a harmful substance, acting as an irritant poison. It has frequently caused death in animals to which it had been administered, though there is but one recorded case (L'Union Medicale, 64 1883), in which it has proven fatal in the human subject. When alum powders are used in baking, most of the alumina which they contain is converted into hydrate of aluminium, smaller portions also probably existing as sulphates and phosphates of aluminium. The official investigation of this class of baking powders made in England, for the purpose of testing their healthfulness, resulted in their favor. This conclusion rested, however, upon the assumption that the hydrate of aluminium which existed in the bread was insoluble in the fluids of the stomach, an assumption which actual experiment has proved to be entirely erroneous. Dr. Mott (Jour. Amer. Chem. Soc. Vol. II, No. 1) gives the results of a series of analyses of the various organs of dogs to which hydrate of aluminium had been administered. The substance proved to have been readily absorbed and to be present in every organ examined. The same author relates experiments upon the influence of hydrate of aluminium and other compounds of aluminium, which showed that they either completely checked or seriously hindered the digestion of ordinary foods. That the use of alum baking powders would ever produce acute poisoning is not maintained, but that their continued use would be likely to lead to derangements of digestion and impairment of health is generally believed by physicians and chemists.

"The alum powders of this market are very cheaply made, contain large amounts of flour or starch, often as much as 50 per cent., and sell for many times their value. Prof. H. A. Weber, chemist to the Ohio Dairy and Food Commission, states in the First Annual Report of that body that, 'if the Dairy and Food Commission should succeed in driving from the State even this one article of daily consumption—the alum baking powder—the people of the State would be amply repaid for the whole cost of the commission, and in this opinion as applied to our own State I heartily concur."

The next and last document offered consists of extracts from pages 30 and 31 of Bulletin No. 10 from the laboratory of the Inland Revenue Department of Canada, 1888, on Baking Powders by A. M. McGill, assistant to chief analyst, which is designated as Plaintiff's Exhibit No. 6.

Mr. Seddon: We object to it on the same grounds as we objected to previous documents.

Mr. Cunningham: On page 30 (reading):

"In conclusion, I would respectfully ask your attention to the following concise summary of my own opinions regarding the subject in general."

On page 31 (reading):

"5. Alum is entirely objectionable as a substitute for cream of tartar, and ought not to be allowed a place in any well-appointed bakery. Not only is the resulting sulphate of soda a powerful purgative and certain to interfere with normal digestive processes when habitually taken into the system, but the aluminium, set free by the reaction of the powder, is capable of rendering insoluble and unavailable the phosphoric acid and phosphates naturally present in food."

J. W. MALLET, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham: Please state your name fully? A. John William Mallet.

Q. Where do you reside? A. At the University of Virginia, which is close to Charlottesville, Virginia.

Q. What is your occupation? A. I am Professor of Chemistry in the University of Virginia.

Q. Of what schools, colleges and institutions of learning are you a graduate? A. A Bachelor of Arts of the University of Dublin, Doctor of Philosophy of the University of Goettenburg, in Germany, Doctor of Medicine in the University of Louisiana, a Doctor of Laws of Princeton and two other institutions.

Q. What has been your career, or work and experience in the line of your profession, and, in that connection, please state what offices or positions you have held? A. I have been continuously occupied as a Chemist and Professor of Chemistry since 1855, with the exception of the four years of the civil war, when I was in the military service of the Confederacy. I have held the office of Professor of Chemistry in the State University of Alabama and the Medical College of Alabama at Mobile. I also was Chemist of the Geological Survey of Alabama, those appointments were prior to the civil war; I was for three years Professor of Chemistry in the Medical Department of the University of Louisiana, as it was then, in New Orleans. I have been for one year Professor of Chemistry at the Jefferson Medical School of Philadelphia; for one year I held the same office in the University of Texas, the State University of Texas; and the rest of the time since the close of the civil war I have been Professor of Chemistry at the University of Virginia, where I am now. I have filled one or two other appointments of an outside kind not interfering with my regular calling; I was a Judge in the Chemical Department of the Philadelphia Exposition of 1876, and I received the same appointment in the Chicago Exposition in 1893, which I declined to accept. I have been recently on a commission, I might call it so, or an informal committee rather, appointed by the city council of Richmond, Virginia, to examine into the question of the improvement of their water supply, and I have had one or two other appointments of that sort.

Q. Have you ever had an appointment, or held a position, on the National Board of Health? A. I was not a member of the National Board of Health, I was employed by the National Board of Health, to conduct an investigation upon the subject of drinking water.

Q. Have your work and studies been directed at all to the subject of food, and the adulteration of food? A. They have.

Q. About in what way? A. Primarily as a teacher of industrial chemistry, in a separate course of lectures upon chemistry as applied to the arts and manufactures, a considerable section of which is devoted to the subject of food. In connection with the Philadelphia Exposition, which I have referred to, the judges in the food department called in aid, in part, the judges of the chemical department in reference to their work, and I have had a number of individual analyses to make and opinions to give, in regard to questions of food from time to time, questions involving food.

Q. For about what period of time has your work or attention been directed to the subject of food or food adulteration? A. I think, I may say, in some measure, ever since I began to teach chemistry, but principally since I began this annual course of lectures upon industrial chemistry, which dates back to 1868.

Q. Have you, during that time, kept yourself in touch with the scientific literature on that subject, with the treatises and published articles of leading scientists? A. I have tried to do so, yes sir.

Q. What, if any, researches, tests and experiments have you made to determine the results of the consequences of the use of alum in the preparation of human food? A. I carried out a series of experiments on the subject in the years 1888 and 1889, most of the work being done, if I recollect correctly, in the year 1888.

Q. Will you state briefly the course which you pursued in your experiments, and also state what results did you obtain, and I will ask you whether you have with you any memorandum which was made by you at the time of these experiments, and, if so, I will ask you to refresh your recollection, if you find it necessary, with that memorandum? A. Yes,

sir; I have the paper which was published on the subject in the London Chemical News. I do not propose to read it in extenso, but if I may be allowed to glance over it and note the principal points covered in it, it will probably answer the question most directly. The main object, in the first place, of the investigation was to examine the effects upon what are known as the residues left by alum baking powders in bread. I assumed it as generally conceded that alum itself was unwholesome, and the defense which at that time, and I believe since, is generally set up for the use of baking powders being that although alum itself may be unwholesome, that the residues which it leaves in bread are harmless, my investigation was directed to distinct tests of whether that is a sound position or not.

The first question, of course, is what are the residues which are left in bread, and there were three things to be considered, some of the baking powders including alum, contained only alum, bicarbonate of soda and starch, others of those that I examined much of the greater number contained alum, acid phosphate of calcium, bicarbonate of soda and starch, so that it became necessary to consider what the residues would be in each of those cases. In the former case, where the alum and bicarbonate of soda are the only active ingredients, the residues, if the two are used in proper proportion, would necessarily consist of hydroxide of aluminium and sulphate of soda.

By the Court: Did you determine that by actual experiment, or do you state that theoretically? A. I state it as the result of actual experiments, and also of the known chemical laws applicable to the subject.

Q. How by actual experiments, by analyzing bread? A. By examining the affects of water upon the baking powder itself, the residues obtained when baking powder is moistened and thereby rendered efficient.

Q. You have not determined it by analysis of the products of actual baking powder? A. No, sir; not direct, that is considerd further on however. In the other case, where acid phosphate of calcium was also present the residues would necessarily contain phosphate of aluminium to a greater or less extent along with the sulphate of soda. That question of the presence of phosphate of aluminium had also been raised

in reference to the presence of phosphates in flour, that is, an alum baking powder, made with alum and bicarbonate of soda only, neglecting the starch, might be expected to form phosphate of aluminium to some extent, which would appear in the residue; that supposition is, of course, covered by the examination for phosphate aluminium as well as hydroxide of aluminium. The effects of sulphate of sodium being well known, my inquiry was directed to the effect, if any, of hydroxide of aluminium and phosphate of aluminium.

The first question examined was as to the actual composition of the baking powders, which were studied. That developed in the main the fact I have already stated that most of them were made with alum and acid phosphate of calcium, some, however, containing alum only.

The second point was to ascertain the amount of carbon dioxide or what is known as carbonic acid gas which was given off from each baking powder by the use of water. The main point aimed at there, for the purpose of this particular investigation, was to see whether the efficiency of the baking powder as measured by the amount of gas which it would give off, and, therefore, the capability of raising the bread and rendering it light, was reasonably fixed, as on that would depend naturally the amount of baking powder which it would be necessary to use in order to convert a given quantity of flour into light bread. The results varied very considerably, there being a variation of, roughly speaking, between the largest and the lowest amount of three to one, the conclusion drawn being that whatever the directions accompanying the baking powder might be, in regard to quantity to be used, that, in all probability, consumers aiming at making light bread, would fall into the habit of using a larger amount of inferior baking powder, baking powder inferior in this respect, that is, they would have then, one giving a larger amount of gas.

The next point examined was, as to such evidence as could be obtained by acting upon the baking powders with cold water and examining the clear liquid as to its containing an excess of either the water or alkaline ingredient, that is, as a test of the degree of fixedness with which the due

proportions of the two ingredients were used. The result was, that in a majority of cases the liquid was an alkali, in other words, that there was an excess of alkali present; the amount was determined, but I need not give the individual figures, they varied very considerably. In two cases the reaction, on the contrary, was acid and if the acidity be counted as representing the amount of alum over and above that required to neutralize the soda that was present, it would be equivalent to a certain determined amount of surplus alum found in those two baking powders. As a matter of fact, in the case of these two baking powders which were made with alum and acid calcium phosphate, the acid was in part due to the excess of the latter salt, although a soluble compound of aluminium was also found to be present.

The next point examined was as to whether the contention, which had commonly been made, that if the alum and bicarbonate of soda were used in the proper proportions, the aluminium would be converted wholly into the insoluble form of hydroxide, or you might add, phosphate. That was examined by testing the solutions which were obtained by acting with water upon the various baking powders, taking the necessary precautions to avoid error, as to whether aluminium in a soluble form was to be found in such liquid; and in the case of the baking powders, including acid phosphate of calcium, calcium was also tested for. In all those solutions, with one exception, aluminium and, where calcium was present, calcium were found in a soluble form, in quite a small quantity in most cases, but, in some cases, to an extent equivalent to several grains of alum to the ounce of baking powder. The question is discussed in some measure, as to in what forms the aluminium and calcium might be assumed to be present. That, I suppose, I may pass over. They were found to be present.

The next point of any importance that is noted is the temperature at which the bread is actually baked, since, upon that would depend the temperature at which the specimens of aluminium hydroxide and aluminium phosphate, which I proposed to experiment with, should be dried in order to put them in the same condition in which they might be expected to exist in baked bread. A number of experiments

were made, partly in a large public oven and partly in a small domestic oven, the domestic oven being of two types, brick and iron. In regard to the temperature of the atmosphere of the ovens and in the bread, the temperature of the atmosphere of the oven was found to range from 472 to 496 Fahrenheit, a little below 500 degrees, but the highest temperature shown by a registering thermometer with its bulb in the center of a small and a larger loaf of bread, ranged from 197 to 212 Fahrenheit, never exceeding the latter point. The boiling point of water is 212, and it might have been foreseen as long as water was present in the bread, and as baked bread always contains a considerable amount of water, that it would be impossible that the temperature of the interior of the bread should exceed the boiling point of water. As a matter of fact, it was found never to exceed it, and in most cases to fall below it. That, then, led to the determination of the composition as respects the amount of water, of aluminium hydroxide and aluminium phosphate which had been precipitated and artificially dried for experiments. The drying was conducted by heating it, precipitated in its moist condition in each case, in a tube the temperature of which was kept at, or close to 212 degrees Fahrenheit, the boiling point of water, and drawing through the tube a slow current of air which was kept nearly saturated with moisture at the same temperature, so as to place each material as nearly as possible, in the condition in which it would actually exist in bread as it was being baked. In each case the amount of water was determined which was given off by heating the material thus dried. In the case of aluminium hydroxide the amount of water was partly that of the water existing as such, and party that formed by the decomposition of the hydroxide by the heat and its conversion into the oxide of aluminium.

In the case of the phosphate of aluminium the water was assumed to be there present as pre-existent, the amount was determined, and the figures are stated here, but I suppose they are immaterial.

Q. Pardon, me Doctor, the paper that you are using is simply to refresh your memory; if you think it pertinent to state the results in figures, or percentages, you had better do so, because the paper that you have in your hand is not evidence in the case. It is simply to refresh your memory. A.

I understand. I do not think these figures are particularly important, the main point is simply that the attempt was made, and I believe successfully, to place these materials, before experimenting with them, in as nearly as possible the condition, as represents moisture, the same as in which they would actively exist in baked bread.

Now, then, as to the experiment upon the influence on digestion of moderate doses of these two substances, aluminium hydroxide and aluminium phosphate when swallowed shortly before or along with food; the experiments were made on my own person. I took a number of doses, in each case carefully weighed, of one or the other, using one in each experiment of one or the other of those two substances, and dried as already described, in some cases shortly before a meal, and in other cases along with food. The quantities taken were intentionally made larger than those that might be reasonable expected to be derived from a meal of bread made with alum baking powder, the object being to ascertain what were the quantities with which any perceptible effect could be observed, and expecting to reason from that down by inference to a probably less effect that might be obtainable, and which might be very difficult to identify from the bread itself with a smaller quantity of the residues of alum in it. I did not believe in beginning the experiments that it was at all likely that the amount of either of these substances left in the bread of an ordinary meal, the bread being made with alum baking powder, would be likely to present noticeable or easily verifiable effects, I therefore used larger quantities for determining the relation in quantity between the doses taken and the quantity that might be present in bread. That will be explained in a moment. I had better read a sentence or two here, because those experiments depended upon my own sensations and I had better record what the experience was in the words jotted down at the time the experiments were made, with intervals of three or four days between them. The food taken was of various kinds, but always simple and wholesome and not likely of itself to produce disturbances of digestion. There was no pre-existing derangement of the digestive functions when any experiment was undertaken; as much care as possible was taken to avoid any mere fancying of expected symptoms and to state with moderation what was actually

experienced. The results of all the experiments made were recorded, that is, these were not selected experiments, but all were made and a record was preserved in the words which seemed at the time most accurate to express the sensations observed. I may add to what is contained in the printed paper, one other precaution which was taken in some of the experiments, some of those in which the alum residues were used along with the food. Those were the only ones in which this was possible. I got another person to put the doses into certain specimens of food and not into others, not telling me when the aluminium hydroxide or phosphate was introduced and when it was not, and leaving me to identify the fact of its having been introduced or not. In every case in which that was done I did identify the particular meal to which the addition had been made.

While on two or three occasions, particularly with the smallest doses used, there was no clearly observable effect the general tenor of the experiments seemed to establish beyond doubt, on my part, the fact that the ingestion of the aluminium compounds used produced an inhibitory effect of gastric digestion, while, in some cases, particularly with the larger doses, and on the whole, rather with the hydroxide than the phosphate for equal weights of the two, the interference with the course of digestion was very notable. There was no gastric pain, nor were there any other symptoms of gastric or intestinal irritation, but simply the well-known oppressive sensations of indigestion, properly so called, lasting for a longer or shorter time, but generally for at least two or three hours after the taking of the food.

The quantity of aluminium hydroxide swallowed in each experiment averaged from ten to fifty grains, the average for all the experiments being about 28 grains. The quantity of aluminium phosphate used ranged from ten to one hundred grains, the average being 45 grains. These doses were intentionally made larger than the quantities of the aluminium compounds in question derivable from such an amount of bread as would be usually eaten at a time if alum baking powder in anything like usual proportions had been employed in making it. The object was to ascertain with what doses distinct effects were noticeable, and this seemed to be gen-

erally the case with any dose not less than twenty grains of the hydroxide, or with not less than thirty or forty grains of the phosphate. It may, of course, be reasonably supposed, that a considerably less quantity than would be necessary to produce decided discomfort when once administered might prove objectionable and injurious if habitually taken as a part of the bread of each daily meal. With the proportion of alum in most of the baking powders in use with the allowance of two teaspoonfuls (counted as about 200 grains, although as much as 250 grains was found to be sometimes measured by a cook). I may say here, that I repeatedly measured two teaspoonfuls myself and weighed the quantity and I found it averaged about 200 grains. I got a negro cook for my own household also to measure out two teaspoonfuls repeatedly, giving no instructions whatever as to how they were to be measured, simply telling her to measure out two teaspoonfuls, and I found that she varied very much, but that she sometimes measured as much as 250 grains. Of course it is necessary to assume how much would be actually introduced by following instructions. The proportion given in most of the baking powders in use being an allowance of "two teaspoonfuls of powder to a quart of flour," and assuming 35 or 40 per cent. of water in baked bread, a pound of bread would contain about thirteen or fourteen grains of aluminium hydroxide, if alum alone were used in making the powder, or about twenty or twenty-one grains of aluminium phosphate if alum and calcium acid phosphate were used together, and all the aluminium were left in the bread as phosphate—these weights being taken for the substances assumed in the condition of hydration shown by the experiments recorded in preceding experiments. That is counting them with the same proportion of water as in the specimens experimented with, so that summing up, the main points are these, that doses of twenty or more grains of aluminium hydroxide appeared to produce a distinct effect upon digestion, while a pound of bread under conditions assumed to be normal, would contain about thirteen or fourteen of such grains, or, roughly speaking, fifty per cent. more aluminium hydroxide than would be derived from the pound of bread, seemed to produce a distinctly noticeable effect.

By the Court: You mean 100 per cent. don't you? A. No, sir; 50 per cent, as between 13 and 14 grains and 20 grains.

Q. You were referring to 28 grains? A. That referred to the amount swallowed, the statement was, that the average amount swallowed was 28 grains at a dose, but when the doses, which varied, some being made smaller and some larger, when the doses are twenty grains, or over, they appeared to produce a noticeable effect. Now the difference between 13 and 14 grains to the pound of bread and 20 grains, would be, roughly speaking, 50 per cent., in other words, the bread might be assumed to contain two-thirds of such a dose as would sensibly affect the digestion. In the case of the aluminium phosphate about 20 to 21 grains of aluminium phosphate would be present to the pound of bread, and when the dose was not less than 30 or 40 grains, if you take the larger figure it would be then 100 per cent. of the amount that might be present in the bread, 100 per cent more, or double the quantity would suffice to produce a noticeable effect.

Q. Then, your conclusion was, that in order to get enough of these particular substances in the bread baked with alum baking powder or produce the results from those particular substances, the subject would have to eat a loaf and a half, or two loaves of bread? A. Not exactly, the conclusion would be to produce such an effect as one could feel reasonably sure of by such a dose, it being pointed out before that an amount much smaller than would be effective in a single dose if taken day by day, might be reasonably inferred to be enough to be injurious, but the evidence here was based on such a quantity as given at a single dose, would produce a perceptible effect.

The next point examined was to endeavor to throw some light on the nature or cause of the interference with digestion of these aluminium compounds. For that purpose an artificial gastric juice was prepared, such as has been very often used here by physiological chemists, by dissolving 2.5 parts of real hydrochloric acid, and three parts of a good specimen of soluble pepsin in water enough to produce 1,000 parts of the liquid. Then a weighed quantity, about 50 grains, of either aluminium hydroxide, or aluminium phosphate, carefully prepared and dried, as before described, was

added to such a quantity of this liquid as contained somewhat more hydrochloric acid than would suffice for complete solution. The mixture was allowed to stand, shaking it occasionally, in a stoppered glass flask at about the temperature of the human body for a period which might be taken to represent something like the term of gastric digestion, taking it about two or two and a half hours. The liquid was then filtered and a definite portion of it evaporated to dryness at a low temperature over a water bath, the residue dried at the boiling point of water, and weighed. This residue was afterwards heated to redness in the air until all water was expelled and all organic matter burned off, and a second weighing made. In like manner the undissolved matter left upon the filter was dried at 212 degrees, weighed, heated to redness in the air, and again weighed. A definite portion of the original liquid (artificial gastric juice) which had not been treated with either of the aluminium compounds was also, for the purpose of comparison, evaporated to dryness, the residue dried at 212 degrees, weighed, burned and weighed again. And, finally, weighed portions of the particular lots of aluminium hydroxide and aluminium phosphate employed were treated in the same way, and the loss of weight at 212 degree, and after heating to redness, ascertained. Now, then, without reading the remainder, the general conclusion was that in both cases the aluminium ocmpound was in part dissolved, and on the other hand, a part of the organic matter present, which was in this case pepsin, was precipitated, indicating the two effetes upon the gastric juice, on the one hand a partial combination of its hydrochloric acid with the aluminium, which was thereby rendered soluble, and on the other hand, a precipitation in insoluble form of the pepsin, the other principal constituent of the gastric juice.

By the Court: To what extent? A. The figures are here, "When aluminium hydroxide was used from 47.3 to 61.8 per cent. of it was dissolved, from 5.6 to 14.5 per cent. of the pepsin being at the same time precipitated.

By Mr. Cunningham: Repeat that last, I did not catch that. A. "From 5.6 to 14.5 per cent. of the pepsin being at the same time precipitated or thrown down from the solution."

By the Court: How did the quantity of gastric juice used in the experiment compare with the quantity that is usually present in the stomach? A. Well, I don't know sir, that we have the means of stating with precision the quantity present in the human stomach at any one time. There have been determinations made up that presented a very wide range in variation as to the supposed total secretion of gastric juice in 24 hours, but the difficulty is manifest in the attempt at determining the amount in the stomach at any one time.

By the Court: I presume it could be determined within limits, that is within a pound or so? A. I think I could give you an approximation to that in figures. Here are some of the determinations of the total secretions, the figures given by Schaefer. It has been said that the quantity of gastric juice in man varies from 16 to 31 pounds for 24 hours. By calculation from recent experiments, these were in 1895, on a dog, the result would be about nine pounds per man, and Bidder and Schmidt, who have been amongst the best of authorities, have assumed the figure at 14 pounds. Now, I took the two figures, 9 and 14 pounds respectively, taking the largest figures. For nine pounds, if you assume 1-4 of one per cent, or 2 ½ parts per thousand, as the amount taken in this artificial gastric juice, that would represent 157½ grains of actual hydrochloric acid in the daily secretion, of real hydrochloric acid, for the lower figure, or 980 grains for the higher figure.

By Mr. Seddon: How much? A. 157½ for 9 pounds for the 24 hours and—what figure did I give the second time?

Q. 900 and something. A. That was wrong, it should have been the line below, 245 grains.

Q. On what quantities are your percentages based, that is what combination of hydrochloric acid— A. I have merely this remark, I have not got the original memorandum, in fact they are no longer in existence, they were destroyed by fire, but the remark is made in each experiment the quantity of liquid contained some more hydrochloric acid than would suffice for complete solution. Now, I can give you the amounts which would give the quantity that would suffice for complete solution here.

Q. You are endeavoring to arrive at the determination of what was in the human stomach, if I understand the experiment? A. Yes, sir; I think I can answer your question in this way, there certainly would be, in taking these figures, an amount of hydrochloric acid considerably more than sufficient to dissolve the whole amount of aluminium hydroxide or phosphate used.

Q. That is in the course of 24 hours? A. That is in the course of 24 hours. The amount which was actually used in these experiments is said to have been something more than a quantity of this liquid containing somewhat more hydrochloric acid than would suffice for complete solution. Now, whether the case would be alone governed by the solution, or, rather, on the 24 hours secretion of gastric juice, I could not say, but I presume the latter, but the secretion of 24 hours is not present, of course, in the stomach at any one time.

I have answered in regard to the aluminium hydroxide the question as to quantity. Now, when aluminium phosphate was used the proportion of it taken up by the liquid ranged from 38.2 per cent to 49.1 per cent, and from 25.8 per cent. to 32.9 per cent. of the pepsin was rendered insoluble. In other words, the main difference between the two appeared to be that the amount of aluminium hydroxide dissolved, formed a larger proportion of the whole of that which was present of the amount of aluminium phosphate, but, on the other hand the precipitation of pepsin appeared to be carried further by the aluminium phosphate than by the aluminium hydroxide. It is only right to say that these figures represent but approximate quantitative results, they cannot be absolutely depended on with sharpness for organic matter precipitated, as it was found extremely difficult to secure equal drying of the materials weighed, and moreover in the case of the aluminium hydroxide, added to the artificial gastric juice, a turbid gelatinous liquid was produced which it was impossible to filter to a state of perfect clearness. It was shown, however, distinctly that there was a double effect on the liquid treated, both the principal constituents of natural gastric juice being influenced: the hydrochloric acid was in part charged with the aluminium used, taken up in soluble form; and there was simultaneous removal from solu-

tion of the organic matter represented by the digestive ferment pepsin.

By the Court: I understand in regard to the artificial gastric juice that you added to it an excess of hydrochloric acid? A. No, the amount of hydrochloric acid added to the water and to the pepsin, was as near as could be estimated the amount that was naturally present in gastric juice, it is an imitation of the gastric juice.

Q. You added to that, I understand you to say, somewhat more hydrochloric acid than was necessary? A. No, sir; the amount of this gastric juice taken for each experiment was such as to contain somewhat more than would suffice to dissolve the amount of aluminium compound introduced. This double effect may fairly be taken to indicate impairment of digestive efficacy of the natural gastric juice if exposed to similar treatment. The last point was noted. Although I have not as yet made any direct experiments on this point, it seems highly probable that the second of the two effects above noticed, namely, the partial precipitation in insoluble form of some of the organic matter of a liquid having the general composition of gastric juice, would be brought about also if soluble albumenoid and other forms of organic matter of food were similarly treated, the aluminium hydroxide or phosphate apparently entering into a sort of more or less loosely united compound with such organic matter, somewhat as is the case when, in dyeing, coloring substances of organic origin are fixed by aluminium mordants. If so, there would be apparent a further explanation of the impairment of digestion of the aluminium compounds in question, a part of the food, already in soluble form, being rendered insoluble on the one hand, while on the other the integrity of at least one of the most important digestive fluids of the body being interfered with, the power of dealing with the portion of the food requiring solution would be reduced.

By the Court: That would be the case with any kind of food introduced into the stomach, does it not take up some of the gastric juice? A. The point is not the effect of the gastric juice on the food, but the effect of the aluminium compound on the food. If these aluminium compounds have the power of rendering insoluble the pepsin of the gastric

juice, they might be expected, in like manner to render insoluble portions of the soluble food itself; that a portion of the food would be rendered insoluble in water, while at the same time the gastric juice would lose, in part, its power of dealing with what remains, the remainder of the insoluble portion. A portion of the protein matter of our food, or the albumenoid matter is frequently taken in a soluble form already, while another portion is insoluble; now, if a portion of the soluble proteid matter is precipitated and the portion for dealing with the power of the gastric juice you have a double source of impairment of digestion from the introduction of the aluminium compound. The general conclusion was reached in a single sentence, "From the general nature of the results obtained the conclusion may fairly be deduced that, not only alum itself, but the residues which its use in baking powder leaves in bread, cannot be viewed as harmless, but must be ranked as objectionable, and should be avoided when the object aimed at is the production of wholesome bread."

By Mr. Cunningham: Please state, if you can, whether or not there is a uniform consensus of opinion of medical men and scientists to the effect that alum used in the preparation of food is wholesome and harmless? A. Certainly, there is not; I understood the question to be whether there is a concensus of opinion that alum is wholesome and harmless, I say there is certainly not such a concensus.

Q. On which side of the question, in your opinion, is the weight of authority of the scientists who have written on that subject? A. Of course, I can only answer that question by giving my own impression of the existing weight of authority, I think the weight of authority is—

Mr. Seddon: If your Honor please, I should like to make an objection on this ground, that if there is anything accepted in science it may be referred to as evidence in the case, but the questions of science cannot be determined by what anyone may think is the weight of authority; anything that has gone into the realm of books of science the Court may take judicial notice of, but I do not think it is proper to ask a witness what is the weight of authority.

The Court: I think the witness has gone as far as he can go on that, he says there is not a consensus of opinion. The objection is sustained.

Mr. Cunningham: Doctor, are you acquainted with any recent experiments of the physiological effects of alum or of compounds of aluminium. A. Yes, sir; two of the most recent that I have seen are the experiments which have been published by Paul Siem and by Gollken, in Germany, who experimented upon the lower animals.

Q. Now, please state what were the results and the conclusions deduced from them? A. The experiments were made, I should say, not upon alum itself, but other compounds of aluminium, apparently one of the principal reasons of this being the desire to test the effect of aluminium compounds, in which the aluminium itself should be the only substance that could be reasonably supposed to be injurious, so as to see whether there is any specific ill effect attributable to the aluminium compounds in general. The experiments appear to have been made mainly—

By Mr. Seddon: Let me interrupt you there, I did not catch the drift of that until my attention was called to the language that you were using. These are experiments that have been made in Germany, you know nothing of them, except what you have read in some reports? A. I have read the original papers by the experimentors.

Q. That is, the published papers? A. Yes, sir.

Defendant's counsel objects to the evidence as incompetent. Objection sustained.

By Mr. Cunningham: Doctor, I will ask you whether you have formed any opinions upon this question in connection with, or in the light of, the experiments to which you have just referred? A. Yes, sir; I have.

Q. Will you please state what they are? A. I think the evidence is satisfactory, that specific injurious effects from aluminium compounds introduced, in most cases, if not in all, into the blood—I ought to qualify the statement by referring to the fact that the aluminium compounds were introduced by injection into the blood, not simply by swallowing

—there seemed to be specific trains of ill effects consisting partly of interference with digestion, vomiting, obstinate constipation, lowering of temperature, uneasiness, general depression, and certain specific depressing effects of the nervous system, they being the principal ones attributable to these aluminium compounds.

Q. You may go on and state any further of your opinions about it, founded upon the experiments to which you have referred, or if there were any other conclusions that you have reached. A. Probably the best answer to that question would be to say, as far as I know from all sources of information available to me, there are three directions in which ill effects are to be expected from the ingestion of aluminium compounds into the human system; first, a local irritant effect upon the mucous membranes upon the alimentary canal the stomach and intestines; secondly, in so far as absorption takes place, and I am free to say that I believe absorption takes place to a very limited extent of aluminium compounds, but that in so far as absorption takes place, and the aluminium compounds become a part of the blood, that there are distinct ill effects produced directed mainly to the digestion and to the nervous system; and, thirdly, that we have to consider that which I have spoken of more particularly in my paper, the indirect effects upon digestion, I have called them the inhibitory effects, which interfere either with the food or the digestive fluids secreted.

Q. I will ask you whether or not you consider that aluminium compounds reaching the circulation of the blood are definitely poisonous? A. Well, sir, the text books are full of remarks on the difficulty of defining exactly what we mean by a poison, the word poison has been used with a certain amount of latitude; that aluminium and its compounds are not virulent poisons, in the same sense that arsenic and corrosive sublimates and many other well-known poisons are, strictly speaking, I have no doubt, but, on the other hand, in larger quantities, that aluminium compounds are capable of producing mischievous effects, and even fatal effects if the does is large enough, I think is also well established. The question is largely one of degree, one of amount, and they materially produce the same effects and the virulence of those effects is as compared with the amounts used. I believe that what can be predicated of arsenic, can be predicated

of aluminium, I don't mean the symptoms would be precisely the same sort, of course, but the ill effects producable by one and the other, but the amount required to produce such effects in the case of arsenic, for instance, is very greatly smaller than in the case of aluminium.

By the Court: Is the same not true of a common substance in use, for instance chloride of sodium? A. Yes, sir; with this important difference, that, within moderate limits, it is not only not harmful, but a necessary constituent of the human body itself. Take a large dose of common salt and it might produce injurious effects, and doubtless would, but in moderate amounts chloride of sodium is harmless, but that cannot be said of either aluminium or arsenic.

By Mr. Cunningham: Have you read, or heard read, the depositions of Dr. Ernest E. Smith, and Dr. Austin Flint given in this case? A. Yes, sir; I have not heard them read, I have read them.

Q. Now, I will ask you, what, if any criticism you have to make upon the method of their experiments and upon the conclusions they have reached from those experiments? A. Well, sir, there is not much to be said on the subject, but I made a note of some four or five points which seem to me to call for attention; if you will let me refer to that I will answer the question. The main objection to the test in question is the extremely narrow basis upon which it rests. There were but three experiments made, two of them of one kind and but a single one of the other. The one on which the conclusions reached, mainly depends, was an isolated experiment. In all experiments upon a living animal, especially upon a living human being, the conditions are so complicated, so many things to be considered, the strength, the age, sex, health, and the condition in other respects of the person experimented upon, and the condition at the particular time of the experiment, that no conclusions of any force can be reached on the basis of isolated experiments; they require numerous repetitions in order to justify any general conclusion. In this case the main conclusions rest upon a single experiment made upon a single person at one time, and not necessarily leading to the same results, either with the same person at other times,

or with other persons at the same time. I note the fact that in the two experiments referring to the effect upon the secretion of the gastric juice of bread made with and without alum baking powder, the quantity of bread used was quite small, each person received 60 grammes, that is a little less than two ounces of bread; that would represent, of course, a corresponding amount of the residue of the alum baking powder. The most important objection to those experiments, however, is that only the percentage of hydrochloric acid in the extracts used was determined. No evidence was adduced as to whether the total quantity of the secretion was affected. On page 14 of the printed testimony, ignoring this, it was asserted by Dr. Smith that the experiment proved that there was no interference with the secretion of the gastric juice. Now, that conclusion is not warranted by the experiment reported as only the percentage of hydrochloric acid was determined and not the total amount of the secretion, but whether the same amount of gastric juice was secreted, when the alum baking powder was used, and when it was not, there is no evidence to show. The capability of the digestion of food manifestly depends, as far as hydrochloric acid is concerned, on the total amount of hydrochloric acid present, and that depends, in turn, upon the total amount of gastric juice secreted and the percentage in it of hydrochloric acid. The latter alone was determined in these experiments, and not the former. Another objection to those experiments is to be found in the fact that there were only two experiments made, and in one the percentage of hydrochloric acid in the gastric juice when the bread was made without alum baking powder, and when it was made with alum baking powder, differed in the proportion of 69 to 70, representing an increase in this case of hydrochloric acid of 1.4 per cent. when the alum was used, but in the other experiment, the only other experiment, the effect instead of being an increase of 1.4 was a diminution of 16.3 per cent., so that so far as from showing that the secretion of gastric juice was unaffected by the alum baking powder as is claimed in the testimony, the actual results of the two experiments were, in the one, an increase of 1.4 per cent., and in the other case a reduction of 16.3 per cent. The balance of the evidence, as far as these experiments can be taken to prove anything, is against the conclusion drawn, and in favor of the idea that the hydrochloric acid in the gastric juice was dimin-

ished by the use of the alum baking powder. I do not myself attach any importance to experiments so few in number, but if there is any conclusion at all to be drawn from them it is that, on the whole, an introduction of alum baking powder reduces the percentage of hydrochloric acid in the gastric juice. I notice an error on page 43 in the statement that ammonia can be depended upon to precipitate hydroxide of aluminum in the presence of soluble carbo-hydrates.

By the Court:

Q. That is not in Dr. Smith's testimony, is it? A. I think it is, I will tell you in a moment, it is in one of the two; yes, sir, that is Dr. Smith's testimony.

By Mr. Seddon:

Q. What part do you refer to? A. It is just below the middle of the page: "In the presence of soluble carbohydrates in the solution of the bread would ammonia precipitate alumina? A. I think it would, yes, if the aluminum were present as alum." On page 48 the statement is made that combination with the proteids of the bread tends to make aluminum, no doubt aluminum hydroxide is meant, insoluble. If that is so the proteids would be to the same extent also rendered insoluble and thus lose nutritive value; that is, it is put forward there as a ground for assuming that the aluminum hydroxide, as a residue of the alum baking powder in bread, would be rendered harmless because insoluble by combination with the proteids; if that be so, the proteids themselves would be rendered insoluble, the precipitation would affect both, and, therefore, to that extent, it would be admitted that the presence of hydroxide of aluminum had interfered with the nutritive value of the food. I find on page 55, that I believe is Dr. Flint's testimony, the statement that alum is not classified in the books as a poison. Now, in regard to that I glanced at my own books on medical jurisprudence, and the like, and the very first volume that I took up contained the inclusion of alum as a poison.

By Mr. Cunningham:

Q. Just state what those works are, and what you found. A. Quite a recent book is Witthaus & Becker, it is one of the larger text books on medical jurisprudence, it is in

four volumes, and was published in New York in 1896; alum is included in the list of poisons referred to as a true poison and mild corrosive, or intense local irritant. Six fatal cases of poisoning by alum are stated on record, including a man 57 years of age, which was from an ounce, and a child three years old, which was from a teaspoonful. Those are the only two cases in which the quantity is stated. Herold's Manual of Legal Medicine is another recent authority published two years ago, 1898, which includes alum in the list of poisons with the remark that it is a powerful irritant in large quantities and in small doses a powerful astringent. In Taylor's Manual of Jurisprudence, which has been through 11 American and 12 English editions, alum is mentioned, as an irritant poison in large doses, and the opinion of Tardieu, a French authority, is quoted that from half an ounce to an ounce is a fatal dose for an adult. In Blythe's English book on poisons their effects and detection, burnt alum is included in a list of poisons from which persons suffering were admitted to the Berlin hospitals. In Briand & Chaude's French Manual of Legal Medicine, alum is included in the list of poisons. In Dragendorff's Russian work, which is one of very high authority, alum and soluble aluminum salts in general are included in the list of poisons. Here are two American, two English, one French and one Russian authority, which were amongst the first volumes that I took up. I don't think it could be said that it is not classified in the books as a poison.

The last remark is that Dr. Flint thinks that alum "would not interfere with the secretion of the hydrochloric acid of the gastric juice, but would be more likely to retard the secretion of pepsinogen." Now, if that opinion be correct, it may be noted that no measure of pepsin was made in Dr. Smith's experiments. In observing the effect on gastric juice he observed simply the absence of effect on the percentage of hydrochloric acid in the gastric juice. He did not determine the total amount of gastric juice secreted, nor did he determine the proportion of pepsin.

At this point the Court took a recess until 2 p. m.

Q. What do you say to the proposition or statement of Dr. Smith in his deposition that alum or its constituents is found in almost all drinking water? A. Alum is not found

in ordinary drinking water at all. It is sometimes an ingredient in the so-called mineral spring water and gets into that water by seepage as the water passes through masses of shale, but it does not enter into the composition of ordinary drinking water.

Q. You say it does not enter into the composition at all. A. A trace of aluminum hydrate is found in potable water, that is to say it is in quantities so minute as to be unappreciable when we consider the quantity that would be taken into the human body with baking powder. I can if you wish go further and give you the results of a number of analyses made of different potable waters.

Q. I should be pleased to have you give us any information you have prepared on that subject.

The Court: You are now speaking of hydrate of aluminum, the same that results from the decomposition of alum in baking powder? A. Yes, I assume that it is the same. It is not absolutely insoluble. Very minute traces can be present in the water, but they are so minute that they could not be considered at all and might be considered as hydrate of aluminum.

I have here the result of several analyses that I made of ordinary drinking water, and I found that in one case it averaged .27 of one part in a million parts of water. That would be about fifteen one thousandths of a grain to a gallon of water.

Q. About forty three one thousandths of a grain of hydrate of aluminum to a gallon of water. A. Yes, sir.

Q. How many parts to the million did you say? A. I gave it a moment ago as .27 of one part to a million parts of water.

Mr. Seddon: What kind of water? A. I think they were all spring water—they were all drinking water.

Mr. Cunningham: I will ask you, doctor, whether you consider the quantity of alum and its constituents, which you found in drinking water are to be taken at all into consideration as part of the question of the use of alum and its con-

stituents as a food? A. I think clear enough on account of the extremely minute quantities that is found in the water.

Q. Have you compared the figures just given with the figures quoted as being the correct amount of hydrate of aluminum which is said to exist in a pound of bread made with the alum baking powder? A. My asumption is that there is 13 to 14 grains of aluminum hydrate in a pound of bread made with alum baking powder. Now I stated that there was forty-three one thousandths of a single grain in a gallon of water, in other words the quantity in a gallon of water would be to the quantity in a pound of bread as 43 is to 13 or 14 thousand.

Q. You have stated before I believe what criticism you have to make upon the statements of Dr. Flint that alum is not classified in the books as a poison? A. Yes, sir; I stated that.

Q. Is it or is not true that alum and aluminum hydrate are both included in the United States Pharmacepoeia as medicinal agents. A. Yes, four compounds of aluminum are recognized in the last edition, namely, alum itself, burnt alum, aluminum, and aluminum sulphate.

Q. Alum itself, burnt alum, aluminum hydrate, and aluminum sulphate. A. Yes, sir.

Q. As medicinal agents. A. Yes, sir.

Q. What is the effect if alum is taken into the mouth? A. It is somewhat complex in taste. It might be described chiefly as astringent, being somewhat like the taste of ink, or the effect of taking unripe persimmons in the mouth. It is perhaps, slightly sweetish, at the same time I would say that it is slightly acid. This might be summed up by stating that the taste is what we commonly called astringent.

Q. What would be the local effect upon the mouth? A. The local effect would be that it would produce that dry feeling that all astringents produce. Q. Now that answer applies to alum itself. A. Yes, sir.

Q. What have you to say as to the taste of aluminum hydrate? A. Aluminum hydrate is practically tasteless.

Q. Now, doctor have you from personal observation, or from literature or works of standard authors on the subject, learned anything as to the effects alum would have when introduced into the stomach, if so please state what you know in

regard to that matter. A. When alum is taken as alum into the stomach?

Q. Yes. A. Well, its action is commonly described as being astringent and irritable. It will irritate the mucous surface of the stomach and alimentary canal. It will constringe the minute blood vessels of the canal also.

Q. It acts as an astringent and an irritant? A. Yes, sir.

Q. Irritating the mucous membrane lining the stomach and alimentary canal? A. Yes, sir.

Q. You say that it will also produce a constringency of the minute blood vessels of the alimentary canal? A. The minute blood vessels of the surface of the canal.

Q. Now, I will ask you the same question, what effect would alum have when introduced directly into the blood. My first question was, what effect it would have if it were introduced through the mouth into the stomach. That you have answered. Now what effect would it have if introduced directly into the blood? A. Well, it would, generally speaking, act as an astringent there. There is some evidence too, that it will produce a specific effect upon the nervous system. At least it would contribute to producing a disordered condition of the nervous system. In that connection I will also say that if introduced directly into the blood that it has been observed to produce constipation. It has also produced a depression and a lower temperature. It interferes with the digestive functions also. It is classed very much in its general medicinal effects like the salts of lead, there is this difference, however, there is a great tendency on the part of the lead to accumulate in the system, while on the contrary very little tendency on the part of the alum for any of the salts to accumulate in the system.

Q. You say that its general action is very much like that of the salts of lead? A. Yes, its general medicinal effects leads it to be classed very much like the salts of lead, but as I stated there is a tendency on the part of the salts of lead to accumulate in the system, while, in the case of alum or its salts, there is very little tendency to accumulate.

Q. Doctor, I will get you to state whether or not there is a general and a popular prejudice against food containing alum, or against the use of alum in the preparation of food?

A. Yes, I think there is a very wide spread prejudice against the use of alum in the preparation of food.

Q. Have you seen many specimens or packages of baking powder in the market? A. I have seen quite a number of them. I paid more attention to those matters at the time I made these investigations some years ago, but I know that there are very many different kinds on the market.

Q. You mean different brands? A. Yes, sir.

Q. Have you seen any packages on the market as containing alum?

Objected to as incompetent.

Objections sustained.

Plaintiff's counsel then and there excepted to the ruling at the time.

Q. Are there any reasons to fear that in the manufacture of the so-called alum baking powder an amount of alum in excess or above the amount necessary for a complete decomposition of the sodium bicarbonate may be put into the powder so that the excess would be carried into the bread itself as alum, when such powders are used in preparing food? A. I think there are some reasons for fearing that, in fact several reasons. In the first place the manufacturer of the baking powder, we will assume, is aware of the proper proportions and parts in just such a quantity that will, that is such a quantity of the alum and bicarbonate of soda, that they will neutralize each other, in the case of a large manufacture, I think there is no doubt but what these proportions would be correctly observed and the amounts carefully weighed, but they are not all large manufactures, in fact, it has been my observation that many small dealers frequently prepare their own brands of baking powder which are sold on the market, and as they are not the manufacturers of the material and, in fact, know practically nothing of the material, but are simply mixers, there is great danger that they might put in a greater amount of alum than would be decomposed by the bicarbonate of soda. In fact, very few, if any of the makers of baking powder manufacture their own material and have but very little practical or technical education

in chemistry and merely mix it in the proportions given them by the manufacturers of the raw material. This being the case it is doubtful whether the manufacturers, I refer now to the smaller manufacturers, would always put in the proper proportion of alum. There is a second point that I wish to urge and that is as baking powder is but a mixture of these different ingredients, great care should be taken in mixing it, so that it will be uniform throughout. That is to say if not properly mixed, a given quantity taken from one can or even from part of the same can might contain more alum than would be decomposed by the soda, and another part might contain less. It is therefore very important that the alum and the bicarbonate of soda should be carefully mixed so that the consumer may not get a larger quantity of alum in a given quantity of baking powder than would be decomposed by the bicarbonate of soda. I do not think this doubt or fear applies to the large manufacturers, because there is no doubt that as a business proposition they will use proper precautions to see that it is properly mixed in order that their baking powder may maintain a certain standard, but again among the smaller manufacturers, as stated before, some small dealers manufacture their own brands, there is great danger that this precaution will not be observed and, therefore, you always run the risk of getting more alum, at times, than will be decomposed by the quantity of bicarbonate of soda present.

In the third place there is danger in preparing the food that the baking powder will not be thoroughly mixed with the flour and it will be in the bread for instances in spots, that is to say, some parts of the bread will have practically none and others will have an excess due to the imperfect mixing of the flour with the baking powder. As a consequence parts of the same loaf or baking of bread might thus be rendered unwholesome. It follows, therefore, that there is very great danger all down the line starting with the manufacturer and ending with the cook. There is another danger that I should refer to and that is this, owing to the nature of the constituent of the elements in the baking powder, these elements are very apt to partially neutralize each other in the can, and when thus partially neutralized, the baking powder is not so "strong," that is to say a given quantity of the baking powder, say the quantity mentioned in the directions,

will not produce as much leavening gas and, therefore, the user will soon learn to take more of the baking powder than the directions call for. Now the next can they procure may be a can where the elements have not neutralized each other, and, therefore, if they use this larger quantity which they have learned from experience is necessary, they will unconsciously be using too much. Of course if the baking powder is kept perfectly dry and there is a proper admixture of starch there is not so much danger that the elements will neutralize each other, but it will often occur and the result is that the user soon learns to take more of the powder than is necessary for the purpose.

Q. As I understand your last statement there is danger that an excessive amount will be used, because at times the powder may not always be kept perfectly dry and there would be a tendency on the part of the elements to neutralize each other? A. Yes, sir; a partial reaction would take place in the can thereby weakening the leavening power of the powder. I think I have already stated that in conducting these experiments I found in some instances there had been a partial reaction between the constituent elements of the baking powder in the can and, therefore, these cans of baking powder had lost its strength, assuming, of course, that the manufacturer had put in the proper quantities at the beginning.

Q. And you say that the danger on that point arises from the fact that the user or consumer is very apt to get into the habit of using a larger quantity than the directions call for. A. Yes, sir.

Q. If, in alum baking powder, there is an excess of alum over and above the amount necessary to completely decompose the bicarbonate of soda, will alum or its constituents of bread, or in the residue, rather? A. The constituents of alum will undoubtedly remain in the residue, but as to whether they remain there as alum, or whether they remain there as a sulphate of aluminum and sodium sulphate I am unable to say. That would not be a matter though of any consequence here, because whether they remained there as sodium sulphate or aluminum sulphate the effect would be the same. That is to say the effect would be the same as if free alum itself were actually present.

Q. Do I understand you to say that there is a doubt in your mind when there is an excess of alum used, whether the

residue from the excess would be in the shape of alum itself, or its constituent elements. A. Yes, there is a doubt in my mind in that regard, because alum itself when disolved in water may not be present in the shape of free alum, but may be present in the shape of a sodium sulphate or an aluminum sulphate. I stated, however, that it would make no difference because the result would be the same whether it was present as alum or as its constituent elements.

Q. You say that when alum is dissolved in water that it may not be in the water as free alum, but rather in the shape of its constituent elements sulphate of aluminum and sulphate of sodium. A. Yes, sir.

Q. But whether present in one form or the other the result would be the same? A. The affect would be the same whether present as free alum or its constituent element. It may combine with some of the organic matter of flour. That may occur and seems to me quite probable, but, as I stated before, the effect is the same whichever way you put it.

Q. What would be the effect then? A. Well, one of the effects right there would be to render the proteids less soluble thereby, of course, interfering with the process of digestion to that extent.

Q. Then if the alum or its constituents remained in the residue, will the alum itself or its constituents be found in the bread which has been made with such baking powder? A. I have included that in my answer just given stating that there might be a combination with some of the organic matter of the flour and of course that would not occur unless flour had been added. I was supposing a case where baking powder containing an excess of alum was actually used in the preparation of the food.

Q. Now if there is an excess of alum over and above what is necessary to neutralize the bicarbonate of soda, the first result is, as I understand it, that the residue would be present either in the form of alum itself or in the form of an aluminum sulphate and a sodium sulphate. A. Yes, sir.

Q. But whether there as alum or separately as a sodium sulphate, or aluminum sulphate the net result is the same. A. Yes, sir.

Q. Now then if the aluminum hydroxide goes into some compounds of the bread, what would become of the sulphuric acid? A. If you assume that the aluminum hydrate is sepa-

rate you would necessarily have sulphuric present which would be there in that condition and undoubtedly pass out of the stomach in that condition, but it would probably be neutralized when it come into contact with some of the alkilines in the canal.

Q. You say it would be present in that shape? A. In answering your former question you probably misunderstood me. I assumed that the aluminum sulphate as a whole went into the bread and I stated that, in all probability it would there combine with some of the proteids of the bread. Taking the exact terms of your last question it would imply a separation of the sulphuric acid and, as I stated a moment ago, it would probably be present as sulphuric acid to be neutralized when it reached the alkalines in the digestive tract.

The Court: Does it exist in the bread as salphuric acid? A. I have assumed that in the absence of anything else with which it could combine.

Mr. Cunningham: Will such residue as you refer to in the last answer or any part of such residue be soluble in the stomach? A. You mean from the use of ordinary baking powder?

Q. I refer to the residue whether contained in the excess of alum or not. Would it be soluble in the stomach? A. Yes, I have no doubt that it would. My experiments in part prove that directly, and the results may have been easily foretold. You must remember that hydrochloric acid is habitually present and there are other acids such as lastic acid in which these salts are readily soluble.

Q. Now if hydrochloric acid is present what compounds would it form with the salts of aluminum? A. Well, you could bring the salt into a soluble form by the action of a hydrochloric acid which would form a chloride of aluminum. There being present sulphate of sodium as a constituent of the alum coming in contact with the hydrochloric acid it would form chloride of sodium.

Q. So that whether you have the sulphate of sodium and the sulphate of aluminum or the alum itself you would likely have some soluble compounds formed with the hydrochloric acid or the lactic acid if that was present? A. Yes,

sir; if the lactic acid was present the salts would be readily soluble in the lactic acid.

The Court: What form would it take when dissolved in the lactic acid? A. It would take the form of lactate of aluminum.

Q. You say that the hydrate of aluminum is readily soluble in lactic acid? A. Yes, sir; it is readily dissolved by the lactic acid.

The Court: In the strength in which that acid is present in the gastric juices? A. It is readily soluble in lactic acid and there is no doubt in my mind that it is soluble in lactic acid of the strength that would be present in the stomach. In making my experiments I took a very dilute lactic acid, fully as dilute as would be found in the stomach and found that it was readily soluble.

Q. Forming lactate of aluminum you say? A. Yes, sir.

Q. Now Doctor, do I understand you to say in this case, or rather in the case you referred to a while ago that if the alum whether there as alum or in the form of the sulphate of aluminum and sulphate of sodium, comes into contact with the hydrochloric acid there is first formed chloride of aluminum and from the sulphate of sodium and the hydrochloric acid there would be formed chloride of sodium? A. Yes, sir.

Q. Now then, if you had an aluminum sulphate and a sodium sulphate there present would that differ in any way from the alum itself as it existed in the baking powder? A. Well, it would only differ to this extent I could not tell whether the alum was present, as I stated, as alum or as sulphate of aluminum and sulphate of sodium, but those are mere technical expression for the dissociated salts and it would practically be the same as the original alum. I may state in that connection it is a little uncertain how far they are dissociated even when the alum dissolved in ordinary water, but the result is practically the same whether present as free alum or in the form of a salt.

Q. Do I understand, then, the physiological action of the alum would be the same whether present as alum or

as sulphate of aluminum and sulphate of sodium? A. Yes, sir.

Q. You say that even when dissolved in water alum has a tendency to resolve itself into its constituent salts? A. Yes, sir; it is a very loose combination and the two salts are very easily dissociated.

Q. So that as I understand you that it would make no difference in what form it was present? A. No, sir.

Q. Doctor Smith has stated that lactic acid does not occur normally in any part of the digestive tract during digestion, what do you say upon that point? A. I think there is no question but what lactic acid is frequently present, in fact so frequently that you may say it is habitually present, during the process of digestion.

Q. You say that it has been determined that it is so frequently present that you may practiaelly say that it is habitually present in the contents of the stomach during digestion? A. Yes, sir.

Q. Then as a matter of fact, Doctor, it is not there as a result of a depraved digestion is it? A. No I wouldn't say that it was. It is frequently present in a disordered condition of the stomach, but I feel sure that it is a normal constituent of the gastric juice contained in the stomach during the process of digestion.

Q. Doctor, is aluminum or any of its compounds to your knowledge found in any of the natural articles of food, by which I mean the cereal and vegetable food made use of as food by man? A. There has been a great deal of discussion in the past as to whether aluminum has been found in any of the vegetable food and in a large number of cases it seems to me that where its presence has been detected it has come from some outside source. For instance where experiments have been made and vegetables burned to an ash and salts of aluminum discovered I think no doubt the salts of aluminum have come from the soil in which the vegetables were raised and that they were not properly cleansed before being analyzed. In this way the result would show salts of aluminum present in the vegetable when as a matter of fact the chances are that it was derived from the soil which clung to the material as it was not properly cleansed. A number of experiments have been conducted for the pur-

pose of determining whether or not aluminum is ever found in vegetables, but I think where it has been reported as having been found it came from some outside sources.

Q. So that as a matter of fact it has never been known to exist in any of the natural vegetable foods? A. Some years ago a chemist of standing made what apparently was undoubtedly a careful test and claims to have discovered aluminum present in wheat. I do not know how the investigation was conducted, but I understand that proper precautions were taken for the purpose of excluding any outside sources, by carefully cleansing the material before testing it. This seems to be a single exception which probably only goes to prove the rule. It has been remarked that aluminum which is so widely distributed is never found in any of the vegetables even though raised in the soil containing it, when we know as a matter of fact that other substances do enter into the composition of the plant and of course would be consumed and taken into the human body when they were used as food.

Q. How is it as regards the animal tissues? A. I know of no case where it has even been found there.

Q. And you say you know of no cases where aluminum or its salts have been found in any of the vegetable foods where proper precautions have been taken to exclude extraneous sources? A. Yes, sir; except in that one instance which seems to prove the rule.

Q. Now taking up the subject of potable water, what work or researches have you undertaken in that direction? A. I have done a great deal of work in connection with the subject of potable water especially of late. I have been concerned in making extensive researches and examination on the question of rendering clear the waters of the James river from which the city of Richmond, Va., gets its supply, and in that connection I have made investigations into the question of the use of alum in connection with the clarification of water.

Q. Please state what your conclusions were upon the question of the clarification of water by the use of alum? A. It has frequently been proposed to use alum for the purpose of clarifying water for if put into the water in the proper proportion the carbonates of calcium and magnesium break up the alum, and the hydrate of aluminum is pre-

cipitated as a white flocculent or jelly like precipitate and in the precipitation carries down with it the minute particles of silt which renders the water turbid. This being the first process after which the water is drawn off and again filtered, generally through sand.

Q. What have you to say as to the advisability of such a process? A. There is no doubt that if used the proper proportions the carbonates in the water would break up the alum and the aluminum hydrate would be precipitated as I stated before in white flocculent or jelly like precipitates. The water, then being drawn off, there would be nothing left of the alum or any of the salts of aluminum. That would work all right under proper conditions, but the great trouble is that an extravagant amount of alum may be used in which event the carbonates in the water would only break up a certain amount of the alum forming the aluminum hydrate which would be precipitated leaving the excess of alum in solution in the water, in which event it would reach the consumer in that condition.

Q. The alum would not be removed by the second filtration? A. Well, the first process is really only settling the water as it is called. The process of filtration if undertaken after the water is settled would not remove the alum or its salts, present in the water. For that reason—that is owing to the extreme difficulty of gauging the proper proportions I have urged upon the city council of the city of Richmond to use salts of iron instead of salts of aluminum, because if there is an excess of salts of iron used it would not work any injury and would not impair the potability of the water at all because iron is a natural constituent of the human body, on the contrary if an excess of alum was used there is the danger that I have already stated of a portion of the alum remaining in solution in the water after the hydrate of aluminum has been precipitated by the carbonates present in the water and therefore while there might be danger from the use of alum as a coagulant there could be no possible danger from the use of the salts of iron, so that after having fully investigated that question I urged upon the city council to use salts of iron instead of alum for the purpose of clarifying the water.

Q. Let me ask you this question, doctor: Even if alum was used in a quantity that the carbonates in the water could

not break up, thereby leaving a part of the alum in solution in the water, would the amount that would likely get in the water from that source, and from the water into the human body, be anything like the amount of alum or aluminum hydrates that would get into the human body from eating bread made with alum baking powder? A. No, there would be nothing like the quantity. The quantity would be infinitely small as compared with the amount you would get from eating bread made with alum baking powder. I want to state in that connection that I recommended the salts of iron because if there was a surplus of iron there could be no objection to it being a normal constituent of the body.

Q. Doctor, did you read or hear the testimony given by Doctor Keiser in this case? A. I heard the testimony as I was here present in Court, and I afterwards read the typewritten transcript of his testimony.

Q. So that you both heard it at the time and have read it over since? A. Yes, sir.

Q. Will you please state what, if any, criticisms you have to make upon the methods detailed by Doctor Keiser in making his determinations, and the conclusions which he drew from these determinations? A. I read over that testimony likewise the testimony of Doctors Smith and Flint, and I made a few notes on points to which attention should be called, and if you will allow me I can get at the matter much more readily by referring to my memorandum. In the first place there was some testimony from Doctor Keiser regarding the constituent elements composing the baking powder and I find he made sundry errors in his calculations, and there were some errors in his statements regarding the process of analysis. I don't know that it is worth while to go into the detailed figures, but there are some arithmetical errors, and in one case he has stated the sulphate of sodium as about half the real amount. He has made several errors in his calculations with regard to the residue left in the bread when alum baking powder is used. In the first place he states that in an ordinary loaf of bread two teaspoonfuls of baking powder are used and that by weight he has 122½ grains. I find as a matter of fact that the average amount used in baking a loaf of bread would be about 200 grains, and in some cases as high as 250 grains. As his figures for the subsequent calculations were

all based upon the fact that he had 122 1-2 grains of baking powder in the bread the subsequent calculations are all wrong when he comes to estimating the amount of the residue that would remain in the bread after it was baked. As I stated I found it was necessary to use nearly double the amount and his calculations must therefore all be wrong to that extent. I find in his testimony more than once the statement that the residue left in the bread after it was baked, for example, the aluminum hydrate has entirely different properties from the alum used in the baking powder. In fact in one place he says that it has none of the properties of the original alum. That statement is clearly wrong. As a matter of fact aluminum hydrate does possess some of the qualities or properties of alum, both of them being salts of aluminum. Exception must therefore be taken to the statement which he makes and in fact repeats several times during the course of his deposition. The statement is entirely too strong when he says that none of the original properties of the alum remain. There is another point too in which he is in error and that is in regard to the actual bulk of the amount of aluminum hydrate which would remain in the bread after it was baked. On the basis of his own calculation the weight was 9.8 grains, and as a matter of fact there must have been a great deal more, but assuming that to be the amount, he makes the statement that the amount would be in size between the head of a pin and a grain of wheat. He possibly makes an error between the hydroxide of aluminum and the oxide of aluminum. That may possibly be true and no doubt is true as regards the oxide of aluminum, but it is not true as regards the hydroxide of aluminum. Its bulk would be very much greater than that suggested by that comparison.

There is a statement on page — in regard to commercial bicarbonate of soda which I think requires some comment. I will find it and see just what it says. The question there was as I find it, how much carbon dioxide is found in bicarbonate of soda of commerce, using the term commercial bicarbonate of soda and then he goes on and states that he can best answer the question by giving the results of an analysis which showed that commercial bicarbonate of soda contains four-tenths of one per cent. of insoluble matter, and 98.6 per cent. of pure bicarbonate of soda. He assumes that there

is nothing except insoluble matter and pure bicarbonate of soda in the commercial bicarbonate of soda. As a matter of fact he is mistaken there for a number of years ago and in fact it has only been within the last few years that bicarbonate of soda was not mixed with other impurities and other ingredients and therefore there was less pure bicarbonate of soda than his analysis calls for and consequently there would be less carbon dioxide in a given amount of bicarbonate of soda. There are very serious errors on page 104 of the record wherein he speaks about the aluminum passing through the filter leaving all of the organic matter behind. I think he has made a very serious mistake here because the filter that he used would not be the same as the dialyzing membrane, and you could easily confirm my statement by reference to the original papers of Graham.

On page 106 of the record there is some reference to phosphates in the wheat and the question was there, whether there was in it any calcium phosphate or any magnesium phosphate you do not pretend to say, and then he goes on and says that he made no separate determination of anything of that kind, but suggests above that he had found more aluminum hydrate than could come from the amount of alum in baking powder and therefore concludes that the excess came from the grain itself. This is a very serious error there because, as I stated before, only one person has been able to find any aluminum or its salts in the wheat, and I do not think he is justified in saying that the excess over and above what he thought he ought to have might have come from the wheat. Certainly it is something extraordinary if there is that amount of aluminum hydrate in the quantity of flour he used to bake that loaf of bread when so many efforts have been made to ascertain if there was any in the flour at all, and it is very evident in my mind that what he there calculated as hydrate of aluminum was in part phosphate of calcium and phosphate of magnesium.

There are other errors in the analysis and statements as to the mode of making these determinations, but I do not think it is worth while to go into that now.

Q. I will ask you what is your opinion about the tests which Doctor Keiser made for alum or soluble aluminum com-

pounds in the bread? A. Do you refer to what he obtained from the aqueous extract of the bread?

Q. Yes, you remember he stated in considerable detail the method he employed? A. The main objection I have to that is that I do not think his test was correct in that he makes an attempt to precipitate the aluminum hydrate by an ammoniacal solution in the presence of organic matter, now it is a well known fact that organic matter interferes with the precipitation by the use of a solution of ammonia. If there was no organic matter present some reliance could be placed upon that method, but in the presence of the amount of organic matter he had there, certainly he could not expect to precipitate all of the aluminum hydrate that might be present in the aqueous extract by the use of a solution of ammonia for that purpose. The presence, as I stated, of that amount of organic matter would certainly tend to hold back and prevent the precipitation of a considerable quantity of the aluminum hydrate and therefore he could not get anything like an accurate result.

Q. Then as I understand you his efforts to precipitate the aluminum hydrate in the aqueous extract of the bread by the use of a solution of ammonia would be so interfered with by the presence of that amount of organic matter that the result would not be at all accurate? A. Yes, he might miss nearly one-half the quantity if the amount was small.

The Court: In the case you speak of you say the presence of organic matter would hold back part of the aluminum hydrate. Would the organic matter be removed by passing the aqueous extract through a filter or a filtering membraine? A. Some forms are removed and some are not.

Q. Do you recall Doctor Keiser's testimony on that point as to the precautions he took to get rid of the organic matter? A. My recollection is that he said that he undertook to pass it through a filtering membrane.

Q. Now then what have you to say in regard to that matter as to whether or not the filtering membranes which he used would remove all of the organic matter leaving the aluminum hydrate free from organic matter entirely? A. No, the best evidence of that is what would take place in connection with the organic matter in our food. When taken

into the stomach and digested as long as it remains in the form of the original proteids it is practically incapable of passing through the walls of the alimentary canal, thus getting into the blood, but if it is changed into what is called peptones it will be readily absorbed and pass through the walls of the alimentary canal, thus getting into the circulation. I do not think the membranes he used would hold back all of the organic matter and allow only the aluminum hydrate to pass through as he says.

Q. Then as I understand your testimony the method he employed to get rid of the organic matter in the aqueous solution would not, as a matter of fact, remove all of the organic matter present in the solution and that on account of the presence of this organic matter all of the aluminum hydrate would not be precipitated by the solution of ammonia? A. No, I do not think that his method would enable him to determine the true amount of aluminum hydrate in the aqueous extract because they would not remove all of the organic matter and the organic matter not removed would hold back a considerable portion of the aluminum hydrate in the solution and it would not be precipitated by the ammonia. As I understand his statements he used a parchment filter and not a true dialyzing membrane. Not having observed the proper precautions in this matter he could not expect to get accurate results. Now as a matter of fact if he had used a true dialyzing membrane it would have tended to hold back the aluminum salts and therefore there would be less of the aluminum salts in the solution. If he used an ordinary membrane then part of the organic matter would pass through and would prevent the precipitation of the hydrate by the ammonia.

Q. So that in either case the test would be defective? A. Yes, sir; it seems to me so.

Q. And therefore his results would not be accurate? A. No, sir; I do not consider them so.

Q. That is to say while the hydrate of aluminum would pass through an ordinary parchment filter the filter would also allow a considerable portion of the organic matter to pass through which would interfere with the precipitation of the aluminum hydrate by the ammonia? A. Yes, sir.

Q. So that the result would not give you the accurate amount of the aluminum hydrate in the aqueous extract? A. No, sir; it would not.

Q. Now Doctor, regarding the statements of Doctors Smith and Flint that the preparation of the Layton bread when tested by Doctor Smith did not in any way interfere with the digestion of the subject, I will ask you whether or not in your opinion arsenic and other poisons of that character may not be taken into the human body in minute doses without effecting the digestion of the person so taking them? A. Certainly for a short period of time a person might take a very poisonous substance like arsenic in minute quantities and it would probably stimulate the digestion.

Q. The same is true of mercury and other compounds of that character is it not? A. Yes, sir; substances of that kind may be administered in small doses for a short time without injury to the digestion. In fact in some cases it would stimulate the digestion.

Q. Now I will ask you if it is not a fact that aluminum hydrate may also be administered in small doses three times a day for few days without an appreciable effect upon the digestion? A. Yes, aluminum hydrate may be administered in that way for a few days without causing any appreciable effect. Of course understand me it would have to be a small quantity.

Q. I will ask you if the administration of aluminum hydrate for a few days would demonstrate that it was not injurious if it produced no ill effects during the limited time in which it was administered? A. No, sir; it certainly would produce no appreciable effect in small doses in the limited time covered by these experiments. It is the continued and persistent administration that would work the injury.

Q. So that as a matter of fact those experiments covering such a short period of time would not be of any value? A. No, you might as well put arsenic in the Mississippi river near it source and then say, because it would not poison people drinking the water at New Orleans, that arsenic was not poisonous. Because the small quantity is not poisonous when administered a few times is no indication that its persistent administration covering a long period of time might not cause very grave consequences.

Q. Then as I understand your statement it is not the single dose of such substances or several doses covering a period of a few days that would indicate what the same sub-

stance might do if persistently administered, say three times a day, covering a long period of time? A. No. I don't think a small quantity of aluminum hydrate taken into the stomach three times a day that way for a short period of time would have any appreciable effect. It would have to be administered over a long period of time covering weeks and months and perhaps years before the effects would be appreciable.

Q. So that the results obtained from administering this bread, covering a short period of time would not indicate what effect it would have if used three times a day for days, weeks, months and years? A. No, sir.

The Court: In those observations did you take into consideration the capacity of the system to expel these substances? As I understand it such substances as arsenic even though taken in small doses have a tendency to accumulate in the system. Now what I want to know is will the system readily expel the aluminum hydrate or is there a tendency on the part of aluminum hydrate to accumulate in the system in the same manner as arsenic? A. I do not know that there is any tendency on the part of the aluminum hydrate to accumulate in the system like arsenic. The serious results would come from its continued administration.

Q. Have you ever made any attempt to determine what amount of aluminum or its compounds might be administered without having any appreciable effect in inhibiting digestion? A. I never made any attempt to determine the smallest amount that could be administered without inhibiting digestion for, as a matter of fact, a considerable dose, say twenty grains, might be administered at a single dose without having any effect, but the continued administration of that amount would certainly produce injurious effects.

Q. Say for example you take a dose now and a dose in two hours from now and in two hours after that, what would the effect be? A. Well, that would be pretty hard to determine because I could not tell, say if I take 20 grains now and 20 grains in two hours from now, how much of the first dose that I took still remained active in the system at the time I took the second dose.

Q. Then let me ask you if in your opinion could a person take say five grains of aluminum hydrate at a dose three times a day running over a period of days, weeks, months and years without having any appreciable effect upon his diges-

tion? A. I think not, but of course I cannot answer in detail in regard to that because I do not know what quantity if repeatedly administered would cause injurious effects. I can only say of course that it would be less than the amount necessary to produce an effect at a single dose.

The Court: I understood you to say also that there is a tendency on the part of the system to eliminate a substance like an aluminum hydrate and that it is not accumulated in the system like arsenic?

Mr. Cunningham: Do you consider the amount of bread taken by Doctors Irish and Ross a large or small quantity for a healthy person as a daily diet? A. I don't remember the amount used.

Q. I will state for your information, it was six hundred grammes a day? A. That is a full amount if taken as part of the diet. It would not be sufficient if it was administered without anything else.

Q. You mean that it would be an insufficient amount if no other food was taken? A. Yes, sir.

Q. Six hundred grammes would be insufficient? A. It would be insufficient—it would be a low diet if administered or taken without anything else. If taken as part of the daily food it would be sufficient.

Q. It would be sufficient if taken with other food? A. Yes, sir.

Q. Have you considered whether the whole diet taken by Doctor Smith was sufficient for a person in normal health as he was supposed to be? A. Well, I haven't figured the full value and would not like to do so off hand, but it does seem to me that you might call it a fair diet.

Q. For a healthy man of average weight? A. Yes, my recollection is that it was the same as a United States soldier's ration. When a soldier is fed exclusively upon bread and meat, for instance—bread in the form of hard tack. The quantity is diminished when they are furnished with vegetables and other articles of diet like that. Of course the rations will vary under the particular circumstances.

Q. Doctor, then to sum up all you have said please state whether or not in your opinion you regard food pre-

pared with alum baking powder as wholesome and healthful? A. I do not consider that foods prepared with baking powder containing alum are wholesome and healthful for human beings. As I have already stated the administration of the amount of aluminum hydrate contained in the quantity of bread that a person would consume in a day if persisted in for an indefinite length of time would certainly produce serious results. Poisons like arsenic and mercury and things of that kind are not injurious when administered in small doses for a few days, but persisted in are highly injurious and in the same way, as I have just stated, aluminum hydrate if persistently administered would finally produce serious results.

Q. Then do you consider the use of an alum baking powder in the preparation of food as objectionable? A. Yes, sir; if used in the preparation of food I certainly consider it very objectionable.

Q. You consider it unwholesome? A. Yes, sir.

Cross-examination.

By Mr. Seddon: You are Professor of Chemistry in the University of Virginia are you not? A. Yes, sir.

Q. And you have been there for a long time? A. Yes, sir.

Q. What is the nature of your work there as to whether you lecture of physiological chemistry or what may be termed pure chemistry? A. I give two courses of lectures there, one on general chemistry to the academic students and medical students and another course on what I may term industrial and manufacturing chemistry.

Q. Do you make the distinction between physiological chemistry and manufacturing chemistry? A. No, we rather divide it into general chemistry and industrial chemistry. General chemistry is for the academic students and the medical students and the industrial and manufacturing chemistry is another branch or division of my work.

Q. Have you given much time to physiological experiments for the purpose of informing yourself in regard to these matters and keeping up with the current literature in that regard? A. I always include physiological chemistry in my

course of lectures. We of course have a Professor in Physiology there, but I am expected to give instructions on the chemical side.

Q. Your branch of the chemistry then includes physiological chemistry? A. Yes, sir.

Q. How long have you been in the University? A. With the exception of two seasons since 1868.

Q. Were you born in this country? A. No, sir.

Q. Where were you born? A. I was born in Dublin.

Q. How long have you been in this country? A. Since 1853.

Q. Are you a citizen of this country? A. No, sir.

Q. When did you first have your attention called to this particular case? A. Sometime shortly before the previous hearing.

Q. By whom? A. My information that there was such a case was derived from Dr. McMurtry and Major Cunningham.

Q. Do you know Doctor McMurtry? A. Yes, sir.

Q. Who is he? Who does he represent in this matter? A. He is engaged as a manufacturing chemist in New York. I do not know exactly what his relations are, but I believe he has been in charge of the New York Tartar Company and has been for a number of years of the American Chemical Society.

Q. He is in the employ of the Royal Baking Powder Company is he not? A. I do not know his relations to the Royal Baking Powder Company.

Q. You know he is connected with that company do you not?

Mr. Cunningham: I object to that. I don't see what difference it makes what his relations to that company are. I wanted to object to the other question, but he answered it before I could frame my objection.

The Court: I will overrule the objection. He may answer the question.

A. I stated that I did not know what his relations to the Royal Baking Powder Company were.

Q. You say you understand that he is connected with the manufacture of cream of tartar baking powder in New York? A. I know that he has been in charge of the works

of the New York Tartar Company for a number of years. I have heard that there were business relations between that company and the Royal Baking Powder Company, but what those relations are I do not know.

Q. The University of Virginia is a large institution is it not? A. Yes, sir.

Q. About how many students do you have there in attendance? A. About six hundred and fifty now.

Q. You have your regular classes there do you not? A. Yes, sir.

Q. And you are expected to lecture and perform your regular routine work? A. Yes, sir.

Q. And you lecture daily to the students? A. I do not lecture every day. I lecture on some days of the week and not on others.

Q. Well, you have your other daily work to do? A. Yes, sir.

Q. And you are engaged there day by day in the discharge of your duties? A. Yes, sir.

Q. You have made two trips to St. Louis in connection with this case have you not? A. Yes, sir; including my presence here now.

Q. You came here at the request of whom? A. At the request of Doctor McMurtry in the first instance followed by a letter from Major Cunningham.

Q You have been in consultation with those gentlemen since you have been here have you not? A. Yes, sir.

Q. Have you advised them as to how to get at these criticisms you have made on the testimony given by others and how to bring out the points that you think would aid the State's case? A. I was asked to consider the testimony of both Doctor Smith and Doctor Keiser and make such criticisms as I thought I was justified in making and for that purpose I went over the testimony and prepared myself to criticize it as I have done here.

Q. Who asked you to consider the testimony? A. Major Cunningham and possibly Doctor McMurtry.

Q. Have you been in consultation with them in regard to this case and have you made suggestions to them as to what points should be brought out? A. Solely from a scientific point of view.

Q. Certainly I understand that, but what I mean is, you as a scientific man have been in consultation with these gentlemen and have given them the benefit of your information and experience and suggested points which you thought out to be brought out? A. Yes, sir; any points that had a scientific bearing.

Q. Were you employed for that purpose? A. I was employed for the purpose of giving such assistance as my scientific knowledge would enable me to give.

Q. You considered it your duty to do so? A. I considered it my duty to aid them as much as possible.

Q. In developing those scientific points which in your judgment would assist in establishing your view of the case? A. I always endeavor when employed as an expert to give a fair exposition of the matter and be fair to both sides. I would not wish to prejudice the case one way or the other. I always endeavor to give my opinion in regard to these expert matters fully and fairly.

Q. Did you consider it a part of your duty to supply them with such information as you had on the subject? A. I did from a scientific aspect of the case.

Q. You have been paid for your trouble in this matter have you not? A. Yes, sir.

Q. Will you tell us what you have been paid or what you expect to get for your trouble?

Mr. Cunningham: I object to that unless it is shown that counsel has some reason to believe and expects to show that this witness has been bribed. If that is his purpose let him go ahead.

Mr. Seddon: Certainly I have no such intention of that kind and you certainly know it, Major Cunningham. I think this has an important bearing when the Court comes to consider the weight to be given to the testimony of this witness.

The Court: Do you mean to say that the amount he receives determines the character of his testimony?

Mr. Seddon: Well, I think it has an important bearing. If it should be shown here that the witness expected to

get a hundred thousand dollars for his testimony I think the Court ought to consider that matter when it comes to consider the weight to be given to his testimony.

The Court: I will settle the matter by ruling that the witness may answer the question or not just as he sees fit. If he does not wish to disclose what his arrangements are I shall not compel him to answer the question, but if he says that he has no objection to stating what his arrangements are then he may answer the question.

The Witness: I have no objections to stating what my arrangements are.

Mr. Seddon: Will you please state then what your arrangements are for your compensation in this matter? A. I was asked what I would charge for my services, and I gave the same answer that I always give in such cases. I said that I would make no charge for giving my testimony, but would ask fifty dollars a day for lost time and attendance upon the trial in addition to my expenses traveling from here to my home and the fee of two hundred and fifty dollars for work I have done in connection with the case.

Q. Do you consider that as compensation for your lost time in being away from the University? A. Well, I do not exactly consider that as lost time, but for the additional labor involved in getting here and in breaking up my work with my regular classes which I will be obliged to make up on my return.

Q. There is nothing deducted from your compensation at the University on account of your absence is there? A. No, sir.

Q. You have not made any experiments upon alum baking powder since 1888 have you? A. Not upon alum baking powders directly. Part of the testimony I have given here refers to matters connected with the subject of the effect of lactic acid upon hydrate of aluminum and that is based upon recent experiments made by me since that time.

Q. Do you know whether the alum baking powders are the same now that they were when you made your investigations some twelve years ago? A. I believe there has

been some change made in the manufacture principally in this, that since that time sodium alum has been used in the manufacture instead of ammonium alum. They used ammonium chiefly at that time and occasionally potassium alum. I understand now that sodium alum has generally been substituted.

Q. I want to know what you know about it. A. From general information I believe that sodium alum is now commonly used for the purpose of making alum baking powders.

Q. Where did you get the alum baking powders that you experimented with in 1888? A. I bought them at the retail stores.

The Court: Where? A. Charlottesville and partly in Richmond. I think also I got some in Washington and probably some in Norfolk. I recall getting some in Richmond. They were bought in the open market at the grocery store.

Q. Generally speaking you obtained them in the vicinity of your residence? A. Yes, sir; I bought most of them in that vicinity and some in Washington.

Mr. Seddon: Charlottesville is about eighty miles from Richmond is it not? A. It is about a hundred miles from Richmond.

Q. Yes you are right. You say that you bought these baking powders in the open market? A. Yes, sir; I did not get any of them second hand—that is to say I went directly to the stores and purchased them myself.

Q. How did it come that you made those investigations at that time in connection with alum baking powder? A. I don't remember now, but my recollection is that I had been discussing these matters with various parties, and I myself proposed to undertake the investigation for the purpose of settling those questions.

Q. Who first called your attention to this matter? A. Professor Mott of New York. He is dead now. I subsequently discussed the matter with Mr. Hoagland of New York.

Q. Mr. Hoagland was President of the Royal Baking Powder Company was he not? A. Yes, sir.

Q. Mott was chemist for the Royal Baking Powder Company was he not? A. I don't know.

Q. Did you never hear that he was? A. No, I never knew it if he was.

Q. Did you receive any compensation from them for making those investigations? A. For part of the work I did.

Q. For a part of the work? A. Yes, sir.

Q. Are we to understand then, that it was done at the instigation of these people? A. Well, the matter first came up on discussions and I then undertook the investigation for the purpose of determining these matters one way or the other.

Q. But they were very largely interested in it were they not? A. Well, there was a discussion as to whether alum baking powders were wholesome or unwholesome and I suggested that the best method would be to determine it by direct experiment on the subject.

Q. And you made your report to Mr. Hoagland? A. Yes, sir; on the part upon which he desired information. Part of this work was done by me subsequent to this publication.

Q. What part of it did Mr. Hoagland suggest? A. I stated sir, that I do not think that he suggested anything.

Q. You made your report to him? A. Yes, sir.

Q. And it was understood that he was to meet the expenses of doing the work, at least in part? A. Yes, he was to meet the expenses for part of the work.

Q. What part of the work? A. It has been so long ago I cannot tell now. I know though that I did part of the work subsequent to this publication in the Chemical News.

Q. Now did you ascertain what are the proportions in which these two elements you speak of neutralize each other? A. Yes, sir.

Q. Please state it? A. Well, I will have to refer to the figures.

Q. Please get the figures if you can? A. I suppose you refer to sodium alum exclusively?

Q. Yes, what are the proper proportions in which sodium alum and bicarbonate of soda exactly neutralize each other? A. I have the figures here and I find that 475 grains

of burnt alum will exactly neutralize 504 grains of bicarbonate of soda. I think those are the correct figures.

The Court: Does that proportion hold good for sodium alum? A. Yes, sir; I think so.

Q. But then you did not experiment to determine the amount of sodium alum? A. Not directly sir. There can be but one proportion between them.

Mr. Seddon: Baking powder contains starch also, does it not? A. Yes, sir.

Q. Now the amount of baking powder that would be used in ordinary bread would depend upon the amount of starch in the baking powder would it not? A. I don't quite understand your question.

Q. The starch forms a considerable bulk of the baking powder does it not? A. Yes, sir.

Q. And the amount of baking powder you would have to use would depend upon the amount of starch? A. Yes, sir; that is to say starch is not an active principle of the baking powder, but is merely used to keep the other elements from neutralizing each other and of course the more starch you have the greater the quantity of baking powder you would have to use to get the necessary amount of leavening gas.

Q. As I understand it the starch is put in there to keep the powder dry thereby preventing the alum and the soda from neutralizing each other in the can? A. Yes, sir.

Q. Does that amount of starch vary? A. It may vary in some cases, but there must be enough of it to keep the powder dry.

Q. But it always forms a considerable part of the bulk of the baking powder? A. Yes, sir.

Q. And as I stated before it would therefore be necessary to use a larger quantity of baking powder to get the requisite amount of the active ingredients when the proportion of starch used in making the powder was larger? A. Yes, sir.

Q. Now you don't know anything about the amount of starch that was in the baking powder that Doctor Keiser used do you? A. Nothing except from his statement.

Q. You know nothing about that except from his own statement? A. No, sir; nothing except from his own statements.

Q. Was that the same amount of starch that was in the baking powder that you examined in 1888? A. I cannot tell you sir, I haven't the original laboratory notes here.

Q. Your published report does not give the amount of starch? A. No, sir.

Q. Do you say the amount of Prof. Keiser was less or more than you had? A. I didn't say anything about that.

Q. What did you say about it? A. What I said was that he stated that the directions accompanying the baking powder he examined called for two teaspoonfuls of baking powder for each quart of flour, and he said that he had ascertained the weight of two teaspoonfuls to be 122½ grains of baking powder. I stated that by measure two teaspoonfuls of baking powder represent more than 122½ grains of baking powder, in fact, it would represent nearly twice that amount.

Q. That would depend upon the constituent elements of the two baking powders, would it not, that is whether there is more starch? A. How do you mean?

Q. I mean that the more starch you put in the less of the active ingredients you get in a given amount of baking powder, say two teaspoonfuls. A. That does not make any difference in this connection.

Q. How do you mean? A. Because I ascertained that two teaspoonfuls weighed about 200 grains, whereas, as a matter of fact, he makes it only 122½ grains.

Q. Then what? A. Then the residuum would be more than would have from 122½ grains?

Q. Dr. Keiser did not refer to the bulk of that baking powder—didn't he merely refer to it as weighing 122½ grains? A. He said that he ascertained that the amount called for by the directions, two teaspoonfuls weighed 122½ grains, so that he referred to it both by bulk and weight.

Q. Then what criticism did you have to make? A. My criticism was that his subsequent calculations must fail because he started out with less baking powder by weight than would have been used.

Q. If, as a matter of fact, 122½ grains of baking powder was sufficient to properly leaven a fourteen ounce loaf of bread, the residue would be just what he estimates it, would it not? A. Well, he says here, "I took an ordinary loaf of bread to weigh 14 ounces. I prepared the loaf accord-

ing to the directions on the can, being two teaspoonfuls of baking powder to the quart of flour which I ascertained to be 2 per cent.," now he does not state how he made that calculation. My statement was that I ascertained that two teaspoonfuls weighed about 200 grains.

Q. Well then what? A. Prof. Keiser goes on to say that he make a dough which he brought to the proper consistency and baked in an oven to a brown crust on top, after that he said he weighed the loaf of bread which he said he found to weigh 14 ounces. Then he figures out the number of grains to be 6125 which is correct for 14 ounces, then he goes on and says that he took 2 per cent. of that to find the number of grains of baking powder in the 14 ounces and he finds that he has 122½ grains which would be presumably the weight of two teaspoonfuls as compared with 14 ounces of bread. That is the only way I can see that he arrives at that conclusion. But my criticism is that the amount he had must have been more than that.

Q. Well, as I understand it, you made your analysis or rather you made no analysis of the bread that you prepared in 1888. A. I did not prepare any bread from the baking powder in 1888. The bread which I prepared was not for the purpose of ascertaining the amount of baking powder or the amount of the residue in the loaf, I merely examined it solely with reference to the temperature at which it would bake. Some was made for that purpose, but none was made for the purposes such as Dr. Keiser.

Q. You wanted to ascertain the temperature at which the bread would bake. A. Yes, sir; I wanted to ascertain the temperature of the interior of the oven to find at what temperature the bread would bake.

Q. Then you made no bread for the purpose of testing it for free alum or for aluminum hydrate or any of the salts of aluminum that might be present? A. My recollection is that I did not bake any bread with that baking powder at all.

Q. Then, as I understand it the bread you did bake was not for the purpose of testing the baking powder, but was for the purpose of testing the temperature at which the bread was baked. A. Yes, sir.

Q. How was that bread made? A. I have no par-

ticular recollection of that, but I think that it is probable that it is some that was raised with yeast.

Q. Now then in order that there may be no misunderstanding I will ask you whether you baked any bread with baking powder and then analyzed it for free alum, or for aluminum hydrate? A. No, sir.

Q. Why didn't you do that? Did you not think that was pertinent to the inquiry? A. No, sir; I fully explained in my testimony in my examination that if there was a surplus of alum in the baking powder, it or its constituents, would remain in the bread.

Q. Well, would it not be important in your opinion for you to ascertain from the process of cooking the bread that this reaction had taken place, assuming that it was made with properly mixed baking powder. I understood you to say that if properly mixed the elements would neutralize each other, and did you not think it important that as a matter of fact they did neutralize each or whether there was any free alum in the bread? A. No, I did not think it was important to do that for the reason I have just stated.

Q. What are those reasons? A. I stated a moment ago that if alum was present in excess in the baking powder it would necessarily remain in the bread. It could not get away.

Q. Then did you not think it was important to inquire whether that reaction had actually taken place, or whether it had not taken place completely, so that there was free alum in the bread? A. No, sir; because I know it would be there if the alum was in excess.

Q. You made these investigations to such an extent as you did, and yet utterly failed to find whether as a matter of fact there was any free alum in the bread? A. It would have been useless for me to have done so because from my knowledge as a chemist, I know as a matter of fact that it would remain the same.

Q. Then do you mean to say that if a properly mixed alum baking powder is used any free alum would be left in the bread? A. No, I don't say that.

Q. You think if properly mixed the elements will neutralize each other? A. Yes, sir.

Q. Then you did not think it important to ascertain

whether as a matter of fact such reaction had taken place? A. I did not think it important to ascertain whether there was free alum in the bread or not. If the proportions were right the elements would neutralize. If the proportions were not right and the alum was in excess, it would be present in the bread and it would not be necessary to go through a long examination to establish a simple proposition.

Q. Now then supposing for the purpose of this question that there was an excess of alum in the baking powder so that all of the alum would not be neutralized and some of it, as you have stated, would be present in the bread, did you make any analysis to determine in what form it existed in the bread? A. No, sir; for the simple reason that I have already mentioned. If the alum was in excess in the bakink powder it would exist in the bread after the reaction had taken place. If the soda and alum neutralize each other it would not be present.

Q. What I am trying to get at, Doctor, is this, do you know in what form it would exist in the bread, that is to say whether in the form of free alum or its constituents? A. I answered that in my examination in chief this morning or whenever the question was put to me, that if there was an excess of alum, that it would exist there most probably in the form of a sulphate of sodium and a sulphate of aluminum and possibly some combination might take place between the sulphate of aluminum and the proteid constituents forming the organic matter of the bread.

Q. So you cannot tell us now whether it would exist in the form that you have stated, that is as free alum or whether it would exist there as a sulphate of aluminum and sulphate of a sodium. A. I stated, heretofore, that I inclined to the belief that it would exist there in the form of the sulphate for the reason that when alum is dissolved in water it may not exist there as free alum, but would probably exist in the form of the sulphate. That would depend upon the temperature and surrounding conditions. It is immaterial whether it existed there as free alum or the sulphates. The result would be the same.

Q. Now if there was any free alum there could you have ascertained that question? A. I could have ascertained the amount present. I could have ascertained the amount

of sulphuric or radical acid or, in short, I could have ascertained that it was alum or its equivalent.

Q. Could you have ascertained the amount of sodium? A. Yes, sir.

Q. But whether it existed as a double sulphate which you call alum you are not prepared to say. A. No, not positively. It makes no difference, the result is just the same.

Q. Why does it break up that way if it escapes neutralization? A. I think I have already stated to you several times that a simple solution in water, even if cold will often break it up so that it will exist there in the form of the sulphates.

Q. You say that a simple solution in cold water will do that? A. Yes, sir; that is very frequently the case.

Q. Now, Professor, when you analyze the mixture, you found that a complete reaction had taken place, did you not? A. No, sir; in the alum baking powders that I examined in nearly every instance or certainly in the great majority of cases, there was an excess of the constituent one way or the other, sometimes there was a surplus of the bicarbonate of soda, somtimes an excess of the alum, but rarely ever did I find them neutralize each other.

Q. Now did you get out the hydrate of alumina from the mixture? A. How do you mean?

Q. I mean this, if on analysis you found there was an excess of alum would there be a larger quantity of hydrate of aluminum? A. No, sir; the hydrate of aluminum results from the reaction. What free alum there might be over and above the amount necessary for complete reaction, it would not exist there in the form of hydrate of aluminum.

Q. You say it would not exist there as a hydrate of aluminum? A. No, sir; there would not be any additional amount of hydrate of aluminum on account of an excess of free alum that could only result from the reaction. The alum not necessary for the reaction would not exist there as a hydrate of aluminum.

Q. Now suppose you had more of the alum than would be neutralized by the amount of the bicarbonate of soda, would that affect the bread? A. If there was enough bi-

carbonate of soda to furnish enough carbon dioxide to leaven the bread properly, the excess of alum would not interfere with the leavening process, that is to say all of the carbon dioxide would be set free and it would perform the work expected of it so that the presence of an excess of alum would not cut any figure in the result.

Q. That is in the leavening power of the baking powder? A. No, sir; it would not interfere with that at all.

Q. So that if you had a sufficient quantity of soda or rather a quantity of soda sufficient to produce the necessary quantity of carbon dioxide, you would get your result—the bread would be leavened? A. Yes, sir; leaving of course, an excess of alum in the bread either as alum or in the form of a sulphate.

Q. And the excess of alum would not necessarily result in there being a larger quantity of aluminum hydrate? A. No, it would remain there as alum or in the form of the sulphates.

The Court: Do I understand that simply dissolving alum would cause it to break up. A. Yes, sir; the chances are that if just dissolved in water, it would have a tendency to break up that way.

Mr. Seddon: If you had too small an amount of soda, or as you call it an excess of alum, that fact would not affect the amount of aluminum hydrate present? A. No, sir; the amount of aluminum hydrate that is present is the result of the reaction, and if there was more alum than was necessary for a complete reaction that fact would not affect the amount of the hydrate that would be found.

Q. I believe you stated that only in a few cases did you find the proportions exact? A. Yes, sir.

Q. But that the tendency was to use an excess of soda? A. Yes, sir.

Q. And all that you can say is that in using alum baking powder you will have left a certain amount of aluminum hydrate if there is a complete reaction A. Yes, sir.

Q. And if there is not a complete reaction, but an excess of alum, it will be present in the residue in some form? A. Yes, sir.

Q. Now you have spoken about the quantity of aluminum hydrate that would be left in a loaf of bread? A. Yes, sir; I mentioned the amount.

Q. Will you please state that amount again so that I may get it down? A. I said that there would be left between 13 and 14 grains of aluminum hydrate.

Q. From what amount of baking powder? A. I used 200 grains of baking powder.

Q. 200 grains? A. Yes, sir.

Q. To what quantity of flour? A. To a quart of flour.

Q. That would be what per cent.? A. I don't remember just now, I think I had the figures before.

Q. Do you remember how much water was in it? A. I wouldn't be positive about that, but my recollection is that it was 35 or 40 per cent. I made a determination of the amount of water in the bread and my recollection is that it would be somewhere about that amount.

Q. How much would it be? A. I do not remember now and I haven't my original notes before me. I made all these calculations, but have confined myself to giving results here.

Q. You say that you started with 200 grains of baking powder to a quart of flour? A. Yes, sir.

Q. Now then did you try the experiment of baking any of this bread with alum baking powder and then eating it for the purpose of ascertaining in a scientific way what effect it would have upon you. A. No, I did not.

Q. As I understand it the nearest approach to anything like that was when you took the hydrate of aluminum and the phosphate of aluminum in the form of doses, just as you would take medicine, without mixing it with the bread? A. Yes, sir.

Q. Do you remember what doses you took before your meals—have you got a record of that, doctor? A. I have the record here which shows the number of doses, when taken and the amount of the dose. The first one is taken before breakfast, the next is taken with breakfast. The next is taken before dinner, and so on down the list.

Q. Do you remember the amount you took at each of these times? A. The first was aluminum hydrate twenty grains, the next was aluminum phosphate twenty grains, the

next was aluminum hydrate 40 grains taken with breakfast. Do you want me to just read the whole thing?

Q. Let me ask you first, in what form was the hydrate of aluminum? A. It was both pure hydrate of aluminum and pure phosphate of aluminum.

Q. How were they prepared? A. They were prepared under the ordinary conditions to insure chemical purity.

Q. Were they dried? A. They were dried as nearly as possible at the temperature and with the same relation of moisture that would have existed had they been in the bread.

Q. As I understand, you prepared them and dried them under the conditions that would have been present had they existed in the bread in the form as a residue from the baking powder. Then it was taken in just about such doses as would have been administered by a physician. A. It was administered in the doses that I have already stated.

Q. Did you take it along with your meals? A. In some cases it was taken with the meals, sometimes before and sometimes after.

Q. When it was taken before meals how long before the meal was taken did you take the compound? A. From 10 minutes to a quarter of an hour before a regular meal.

Q. With just enough liquid, I suppose to enable you to swallow it. A. Yes, sir.

Q. You don't know, as a matter of fact if its effects was the same as it would have been if it had been baked in the loaf? A. Well, it generally was mixed with a quantity of food shortly after taking, caused by my eating my meals, and, in case if taken after meals, of course, the material which formed the meal was there in the stomach.

Q. Don't you know, as a matter of fact it would have made a material difference if it had actually been taken with the bread. A. I used every endeavor to carry on the test accurately and in my judgment, it demonstrated just about what would have occured had it been in the bread as a part of the food.

Q. You did not think it worth while to take the loaf of bread, mix the hydrate in it, cook the loaf and then see what effect the bread would have, if cooked, did you? A. No, sir; the only difference was that the mixture met

the bread and other food substances in the stomach.

Q. Now, Prof. Mallet do you know or does anyone else know in what form aluminum hydrate exists in the bread that has been made with alum baking powder? A. I think we can say that we do.

Q. Did you analyze any bread to see in what form it existed? A. No, but I think I can say with certainty that it existed there in a form more or less mixed with some of the organic matter of the food. I think there is no doubt in the world about that.

Q. You did not analyze it for the purpose of satisfying yourself, did you? A. I did not think it was necessary.

Q. Then, as a matter of fact, you did not know from scientific investigation, but it is a matter of speculation? A. Certainly, it is a reasonable inference founded on my knowledge of the subject.

Q. Might you not be wrong in your inference? A. No, I think there is every reasonable ground to suppose that it could not exist otherwise than in the form already mentioned. I saw no reason for making those experiments to demonstrate a proposition that was already plain to me.

Q. Isn't it a fact, doctor, that the hydrate of aluminium is capable of forming insoluble compounds with the gluten? A. It is capable of forming both soluble and insoluble compounds with organic matter.

Q. Would it not form insoluble compounds with mucedin and gliadin? A. It is very likely.

Q. Being component parts of the flour? A. I haven't stated anything to contradict that. What I stated a moment ago was, that we have every reason to believe that aluminium hydrate derived from the use of alum baking powder is there as aluminium hydrate, that is to say is taken into the stomach as aluminum hydrate, and as a matter of fact, exists in the bread mixed with the organic matter of the flour and, is evidently there, if there is an excess of alum, as some loose compound?

Q. What do you mean by loose compound? A. A compound that is easily broken up or easily separated.

Q. Well, it remains in that compound in an insoluble form, does it not? A. Not necessarily, some may be soluble and some insoluble.

Q. On what do you base that statement? A. I know that certain aluminum slats when held in solution form certain compounds with organic matter. For instance in the form of an aluminum hydrate it would form a soluble compound with lactic acid, forming a lactate of alumina.

Q. But you didn't think it necessary in order to determine these things to make an analysis of the bread? A. No, sir, not for that purpose.

Q. You have not referred to it in your report? A. Well I will state for your information that I did make some experiments before I dropped the subject, for my own information.

Q. Those are not set out in the report? A. No, sir.

Court here took a recess for 30 minutes.

After recess further proceedings were had as follows:

By Mr. Sedden (resuming the cross-examination of Dr. Mallet):

Q. Doctor, you spoke of the physiological effect of alum. Isn't it a fact that if taken in small doses it produces a mechanical irritating effect? A. It has the effect of irritating the lining membrane of the stomach and alimentary canal.

Q. Taken in large doses it would have what effect? A. Taken in very large doses it would be fatal in its effect—it has been so reported.

Q. Taken in large doses it is considered an emetic and purgative, is it not? A. It has that tendency.

Q. Does it produce vomiting by its irritating effect? A. Yes, sir.

Q. What would you consider a regular dose of alum? A. It is very little used of late years. It has been given as an emetic, and as a purgative, but it is not much used now. It is used as a mouth wash and as a gargle for the throat mainly.

Q. You say it is not much used now? A. It is not in habitual use now.

Q. Now, doctor, I suppose it is true, as you state in your testimony, that injurious substances differ in their ef-

fects and actions according to the doses in which they are given. A. Certainly, yes, sir.

Q. In fact one school of medicine is founded on that theory, is it not? A. I don't know what you refer to.

Q. I asked you if it is not a fact that the homoepathic school of medicine is founded on that theory? A. Well, as I understand it, it is founded on the theory that for a disease you give those remedies which, if given in health would produce the disease itself. That is what I understand to be the theory of the so-called homoepathic school.

Q. In other words, that like cures like? A. Yes, sir.

Q. Is it not a fact that they give substances in extremely small doses, claiming that the effect is greater in small doses? A. Yes, sir.

Q. You know that as a scientifle fact? A. I think the are many men who hold that the administration of remedies to develop their potency, given in small quantities is the proper way to administer them.

Q. And you know as a scientific fact that what we call the homoepathic doses are extremely small doses. A. Yes, sir.

Q. Now you have stated that you gave yourself a dose of 20 grains at one time and that you did not notice any distinct therapntic effect. A. I did not intend to produce any medicinal effect. I wanted to see what effect it would have by way inhibiting digestion.

Q. Interfering with the normal digestion you mean? A. Yes, sir.

Q. You are now referring to hydroxide of aluminum? A. Yes, sir.

Q. Now did you test to see what effect a small dose would have? A. Well I took one dose of 5 grains.

Q. You did not notice any particular effect when you took the 5 grains? A. No, sir.

Q. You took one of 10 I think you said? A. Yes, sir.

Q. What effect have you recorded? A. There was a slight depression.

Q. Was that 10 grains of phosphate? A. Yes, sir.

Q. Did the 20 grains of phosphate have any effect? A. No effect that I could notice with certainty.

Q. You stated that the amount of water or rather the amount of aluminum salts in water could have no effect upon it, did you not? A. Yes, I referred to ordinary drinking water. I did not refer to mineral water that contains alum in large amounts.

Q. I believe you stated that you are not able to recall what was the largest dose that you took without having any bad effect? A. I feel reasonably sure that the smallest dose that produced any effect was the 20-grain dose.

Q. Doses smaller than that produce no appreciable effect? A. There is one of 10 grains that produced a little depression.

Q. And the 10-grain dose did not produce any appreciable effect? A. Why, not enough to be noticeable.

Q. And the 20-grain? A. There was some appreciable effect.

Q. And anything smaller than that you did not notice any effect? A. Not worth recording.

Q. I understood you to say you were not able to say at what doses you would consider that it would have any effect upon the person taking it habitually with the food? A. I could only judge from my own experience in that regard.

Q. It is only speculation then? A. It is an inference from my observation.

Q. I believe you said there is no reason to believe that alum was observed in the circulation, did you not? A. I think as far as our knowledge goes that alum is capable of being absorbed and taken into the circulation to a very small extent. There are some who go so far as to state that fact positively—that it is absorbed.

Q. You are not positive in your statement of that fact, are you? A. No, I would not be positive about it.

Q. Isn't it a fact that it is used in diseases of bowels, and such diorders? A. It may have been used medicinally for those purposes.

Q. But you say that it is not absorbed into the circulation? A. I did not say that. I said that we have reason to believe that it is absorbed to some extent. Others state positively that it is absorbed.

Q. If given for disorders of the bowels would it not

pass out in the regular way? A. Some of it might be absorbed; I cannot answer any more definite than that.

Q. You speak of alum being a poison. You said that the reason why you considered it a poison was that it had produced death in certain doses? A. I don't think I expressed myself exactly that way. I stated that alum was classed by some of the leading authorities as a poison and cases had been reported where it had produced death.

Q. Do you know in what quantities? A. I do not recall now.

Q. Don't you know as a matter of fact that a poison is defined as something that is capable of producing serious and fatal results when taken in small quantities? A. That may be true, but alum is classed among the poisons because it has been known to kill.

Q. Don't you know as a matter of fact that whiskey if administered in large doses will produce fatal results? A. It has.

Q. Now professor, you referred Witthaus & Becker, isn't it a fact that he says that while it is poisonous, that is, while it will produce fatal results in large doses, that in smaller doses it is used as a medicinal remedy? A. I have no doubt that is a fact.

Q. You had heard that? A. Yes, sir, I have heard that.

Q. And you know that as a matter of fact it has been administered in medicinal doses and considered a valuable remedy. A. It has fallen into disuse here in late years.

Q. Then is it not a fact that Dr. Flint may be right in his testimony when he says that it is not to be classed as a poison, although it has produced fatal effects any more than whiskey is to be considered a poison because that has produced fatal effects? A. Well I can only repeat what I have already stated before that as I understood his statement it was not classed as a poison and I said that certain standard writers had classed it as a poison.

Q. Don't you know as a matter of fact that a substance inocenous in small quantities may be given in such quantities as to produce fatal effects? A. Certainly.

Q. I will ask you if the same might not apply to alum? A. Yes, sir.

Q. Might not the same apply to cream of tarter where a case is reported of a person who took 4 ounces of cream of tarter and died in four days? A. Yes, sir.

Q. Yet cream of tarter is not classed as a poison, is it? A. No, sir.

Q. Now isn't it a fact that the definition of the term poison is a substance that if taken internally in small doses will produce serious or fatal consequences? A. That may be considered a fair definition.

Q. Alum or aluminum hydrate if taken in small doses does not produce serious or fatal results? A. No, sir, but I referred to the fact that it was reported in the medical books as being classed among the poisons. There are degrees in poison and some substances are poisonous in homoepathic doses while others have to be taken in considerable quantities to produce serious or fatal results. Prussic or cyanide of potassium is a very virulent poison in a concentrated form and that given in small doses will have a fatal effect. Other things have to be taken in very much larger doses to produce that effect.

Q. Now, doctor, you were speaking of certain results that were produced, nevous results that were produced by subcutenaceous injections of aluminum salts? A. Yes, sir.

Q. Don't you know as a matter of fact that Blythe himself says that subcutenaceous injections of salts of aluminum have been reported to produce bulbar paralysis, but that as a matter of fact, that no malady had yet developed or no injury had yet been detected from its use in the form of a baking powder? A. How is that last?

Q. He states that tons and tons of it are sold every week and as yet no injury had been reported or special malady had been developed. A. You must take that for what it is worth.

Q. He is an eminent authority, is he not? A. Yes, sir.

Q. You would not dispute such an authority? A. No, sir.

Q. Is it not a fact that Blyth there quotes Paul Siem, in regard to its effects? A. Yes, sir.

Q. You are not prepared to deny the results of their experiments, are you? A. No, sir.

Q. Nor are you prepared to deny the reports of Kobert? A. They are authorities whom I highly respect. Siem is yet a young man and he may yet modify his view somewhat.

Q. Their views appear to be well grounded, do they not? A. I am not taking exceptions to anything they say. I take those things for what they are worth. You take my statements for what they are worth.

Q. You conducted your experiments way back in 1888, did you not? A. Yes, sir.

Q. How much hydrochloric acid did you say is in this artificial gastric juice? A. I have no record here of the amount, but the amount was the amount given in the standard formula for artificial gastric juice. I found it sufficient to dissolve the hydrate of alumnia in the experiment and I concluded at the time that from that experiment that sufficient amount would be present in the stomach to have dissolved it also.

Q. What portion of pepsin did you use? A. Three parts in a thousand.

Q. About what proportions of hydrochloric acid? A. About 2½ parts in a thousand.

Q. Is it definitely ascertained or are medical authorities all agreed as to whether hydrochloric acid exists in the stomach or not? A. That may be considered by some as a matter in dispute.

Q. Isn't it a disputed matter now? A. I hardly think so.

Q. And you think there is no doubt that hydrochloric acid is a component part of the gastric secretions? A. I have no doubt of that.

Q. Now what is the object of the gastric juice in the stomach? A. The object is to have the food mixed with the gastric juice to aid the processes of digestion.

Q. Its specific office is to aid in digestion? A. Yes, sir.

Q. What office does the saliva perform? A. It is capable of acting upon the starch of the foods and converting it into sugar. Its action is suspended in the stomach and it remains with the food, but after it gets beyond the stomach and gets into the small intestines it continues its work.

Q. But saliva always exists in the stomach, does it not? A. Yes, sir.

Q. And assists in digestion? A. Yes, sir.

Q. As a matter of fact I believe it has been stated here by some of you gentlemen that no digestion in the strict sense of the word takes place in the stomach, that is to say, it is merely mixed in the stomach and is really digested when it passes beyond the stomach into the intestines. A. That is correct.

Q. Then as a matter of fact, the stomach is a mere recepticle in which the food is mixed and prepared for digestion? A. Yes, sir, strictly speaking that is true; we commonly refer to the food as being digested in the stomach when really it is merely prepared for digestion there.

Q. Is lactic acid always present in the stomach? A. That may be a disputed question. I would think that lactic acid would be found to be present in more instances than it would be found to be absent.

Q. You are not prepared to say that it is a normal constituent, then? A. No, sir.

Q. Is the hydrate of aluminum ever absorbed by the walls of the stomach? A. No, I think not. If it is absorbed by anything it would be by the walls of the intestinal tract.

Q. Anything that tends to irritate the mucous membrane of the stomach tends to increase the flow of the gastric juice? A. Yes, but anything that increases the flow of gastric juice by that means I do not think would be considered beneficial.

Q. Do you know whether or not hydrate of alumina has the effect of increasing the flow of gastric juice? A. I do not know of any specific tendency on the part of hydrate of aluminum to produce that effect.

Q. Well alum has that effect, has it not? A. Not specially.

Q. It will irritate the lining of the stomach, will it not? A. Yes; but that is not exactly the sort of irritation referred to. An irritation which involves an increased flow of gastric juice would also involve what is called a reflex or nervous action. The tendency would be to increase the activity of the gland for the time, but it would injure the stomach finally.

Q. Do you think hydrate of alumnium has the effect of increasing the flow of gastric juice? A. I know of no specific effect of hydrate of aluminum in that direction.

Q. Prof. Mallet, you do not know you said of any authority to the effect that alum is present as a natural constituent in any vegetable or animal compound? A. I said I was not aware of any evidence where that had been definitely demonstrated where proper precautions had been observed to exclude extraneous sources, that is to say, I do not know that alumnium has been found as a constituent of any vegtable substance except in one case where an investigation was made by two eminent Japanese scientists and from the reports I feel quite sure that those experiments were conducted with a view of excluding extraneous sources and it was reported that minute quantities of alumnium had been found in certain Japanese wheat.

Q. What do you say to the statement of eminent authorities that aluminum has frequently been found in certain vegetables like mushrooms? A. Well, I would be prepared to accept that statement on this theory and that is that many plants of that low order sometimes inclose a great deal of the earthy matter in which they are raised so that it is apparently taken up and forms a part of the plant. There is in Virginia what are called Negro heads. They will grow up and inclose quite large quantities of earth. Now if they were gathered and cleansed and reduced to an ash aluminum would doubtless be found, not as a constituent of the plant in reality, but as a constituent of the soil which the plant had taken up. The same may be true of mushrooms and lichens, licopodens and plants of the very low order. When that question was first put to me I had reference to the higher order of plants.

Q. Young in his report of the transactions of the Chemical Society in 1884 refers to the fact that aluminum had been found in wheat, does he not? A. I believe the experiments where aluminum has been found in wheat is confined solely to those cases reported by the Japanese scientists where they had discovered aluminum in certain Japanese wheat. I have no doubt that those experiments were properly made and may be considered accurate, but those are the only ones on record where it has been found in flour.

Q. You will admit, will you not, where it had been found in mushrooms and plants of that order? A. Doubtless it has, but not as a constituent of the plant, I do not think. My statement was that plants of that low order sometimes inclose considerable quantities of the soil in which they grew, and I have no doubt that the aluminum reported as being a constituent of the plant is derived from that source.

Q. And you still insist on the statement that it is not a constituent part of the animal or vegetable substances? A. With the explanations already made I insist that I am correct in my view and it has often been remarked that aluminum, so widely distributed is never taken up by the plants growing in the soil in which it exists, when as a matter of fact, plants do take up other inorganic substances.

Q. I have before me an extract from Mayor in which he says aluminum is found in a series of plants as a regular constituent, and frequently in not subordinate amounts. In the lycopodium complanatum, acetate of aluminum occurs in such quantities that a lie made from the plants may be used directly in dying as a mordant. This same salt has been found in wine grapes and it an asured fact that various parts of the grape vine on incineration leave in the residual aluminum compounds. Vanqueline states that he found acetate of aluminum in the sap of the birch. A. I have already stated that in cases of the low order of the plants like the lycopodium a great deal of organic matter is taken up and inclosed in the plant and on analysis is present, not as a constituent of the plant but as a constituent of the soil inclosed in the plant.

Q. Who is Yoshida? A. He is the Japanese chemist, I think that is the name, who found aluminum in certain specimens of Japanese wheat. That is the only reported instance that I think we can attach any weight to, for, as I have already stated I understand that proper precautions were taken to exclude extraneous sources.

Q. You are aware, are you not, that in the hull or the skin of the pea a large quantity of aluminum has been found? A. I have heard of some of those instances.

Q. You have no doubt, have you, that there conclusions are correct? A. They are given like any others for what they are worth.

Q. Are you aware of the fact that reputable authorities contend that aluminum is found in mother's milk? A. I have heard that statement made, but like everything else it would have to go for what it is worth.

Q. You are not denying it? A. I am neither admitting or denying it.

Q. Do you know that Bergstrand who is a director of the German Chemical School, states that he finds in Sweden, at Westerbotten, that the soils contain federalum, and aqueous sulphate of aluminum and that the mountain raspberry, rubus articus, grows well on it? A. I have heard that statement.

Q. He goes on to say that the soil must contain three per cent federalum, the gave 4.68 per cent of ash, of which 5.59 was aluminum and 12.60 per cent of sulphuric acid. A. I do not know anything about that.

The Court: I understood you to say that its effect upon the artificial gastric juice was to precipitate a portion of the pepsin and take up a portion of the hydrochloric acid. A. In part.

Q. Would that cause it to interfere with the digestion? A. In this, that more pepsin would have to be secreted and thereby it would cause those organs or compel those organs to secrete a greater quantity.

Q. And it would retard the digestion to that extent or cause the glands to secrete a greater quantity. A. Yes, sir.

Q. But that is your conclusion from the artificial gastric juice? A. Yes, sir.

Q. And of course not from a direct experiment on the stomach? A. Yes, sir.

By Mr. Seddon: Aluminum is one of the most widely distributed of all the materials of the earth, is it not? A. Yes, sir.

Q. It is the chief component part of the earth. A. It is one of the chief parts.

Q. Is it not the chief? A. No, silica and oxigen exist in larger quantities.

Q. I am speaking of the clay of the earth. A. Yes, it is one of the chief components of the clay of the earth.

Q. And is universally distributed? A. Yes, sir, and it has often been remarked that while it is so abundant it was not taken up as a component part of vegetable or animal matter. It is quite remarkable, I think, on that account.

Q. What edition of Taylor's Medical Jurisprudence did you refer to when you speak of alum being classed there as a poison? A. I referred to the 11 American Edition, from the 12th English, on page 98.

Q. I have here a later edition. Will you please look at it and see what they say here in regard to that matter? That is to say, do you find it is here classed as a poison? A. I do not find it this edition.

Q. Then it must have been omitted from the later editions. A. It appears to have been.

Q. You cannot find it at all? A. No, sir.

Q. Do you know a Henry Froughling? A. I know there is such a person; I have never met him.

Q. Do you not know that he is connected with the Commissioner of Agriculture for the State of Virginia? A. I do not know that sir.

Q. Please look at this report, dated Richmond. Va., April 24, 1899, and read what he says there? A. Well he states in substance here that alum as an ingredient in baking powder is not injurious to health.

Objected to on the ground that there is no evidence to show that this is an authentic report.

The Court: The witness may state if he konws anything about the person and I will take his statements contained in the pamphlet for what they are worth.

The witness: I will state that I have heard of this person, but I do not place any credence on what he says. I had occasion to go over some of his work and I almost invariably find that his work is very inaccurate and therefore I can not accept anything he says. It is a little disagreeable to say that, but I do not attach any scientific importance to his statement because I have found so many errors in his work. He is not in the employ of the Commissioner of Agriculture. He has done some work probably for them, but I do not attach any scientific weight to his testimony.

Q. Do you know Dr. Wiley, of Washington? A. Yes, sir.

Q. What connection has he with the Department of Agriculture? A. He is the Chief Chemist of the Department.

Q. Have you ever seen his report on the subject of alum in baking powder, in which he criticises your work? A. I have not seen his work, but I have heard that the report was made.

Q. Who is Mr. Crampton? A. He is the Assistant Chemist.

Q. This report is the report of an investigation made under his direction, is it not? A. Under the direction of whom?

Q. Under the direction of Dr. Wiley. A. I suppose so.

Q. That was published soon after your experiments were made, was it not? A. Yes, sir.

Q. Now I want to ask you what you have to say in regard to his criticism of your experiments? I, therefore, call attention to the following bulletin:—Bulletin No. 13, U. S. Department of Agriculture, Division of Chemistry. Foods and Food adulterants. Investigations made under the direction of Dr. H. W. Wiley, Chief Chemist. Part 5th, Baking Powders, by C. A. Crampton, Assistant Chemist. Published by authority of the Secretary of Agriculture with the following preparatory note: Washington, D. C., Aug. 17, 1889. Sir: I submit herewith for your examination and approval part 5 of Bulletin No. 13 on the Adulteration of Food. The present part consists of an investigation of baking powder and a resume of our present knowledge on subject. In these investigation we have used every endeavor to avoid error and bias. No particular powder has been favored at the expense of any other one. Our samples have been purchased in open market and we have had them to represent, as fairly as possible, the character of the goods sold. In such an investigation it is not possible to get results which will please every dealer and manufacturer and we may, therefore, expect that many of our data will be distorted or denied by interested parties. A more serious embarrassment may also confront us and that is the use of isolated portions

of this report for advertising purposes. The public official who lends the name and authority of his office for advertising purposes has little regard for either, and less for the proprieties of his position. He has, however, no longer control of the data of his analyses when they have once been published by the proper authorities. It would be well in view of such facts if the use of such matter for advertising purposes could be absolutely forbidden. In the present case I would like to emphasize the statement that any data or statements in the present bulletin which may be paraded by advertisers in the praise of their wares, would show a discrimination wholly unauthorized by the spirit and scope of this work. Respectfully submitted,

H. W. WILEY, Chemist.

Mr. Cunningham: I would like to ask if you are quoting the statements of Dr. Wiley himself or the gentlemen who made the report? Let me see that a moment. (Taking the book.) This is manifestly from Mr. Crampton, the Assistant Chemist. I will submit the book to the witness and let him base his answer on the book as he finds it.

The witness: This appears to be the report of Mr. Crampton, the Assistant Chemist who submits it to his chief who in turn submits it to the Secretary.

Mr. Seddon: We are not making any point on that. It eminates from the Dept. of Agriculture and it makes no difference who may have made the investigation, they are adopted by the Chief Chemists. I want to ask you what you think of the conclusion of the Chemist of the Department where he says "As the experiments made by Prof. Mallet are the most recent on this subject, I here quote his conclusion." "I may say that most of those based on purely chemical work I can indorse, having confirmed many in my own work, but I think the evidence furnished by his physiological work is hardly sufficient to justify his conclusion as to the harmfulness of such powders."

A. What question did you want to ask?

Q. I wanted to ask you what you have to say in regard to his statement regarding the conclusions you reached

as the result of your work. A. I can only say like everything else that has been stated here, my experiments can be taken for what they are worth and of course he has a perfect right to criticise them.

Q. Have you ever analyzed any cream of tartar baking powder? A. I have examined some of them.

Q. What is the composition of cream of tartar baking powder? A. Cream of tartar, being a bitartrate of sodium potasium, bicarbonate of soda and starch. I have sometimes found tartaric acid.

Q. What is the reaction? A. I believe I mentioned the starch.

Q. Yes, what is the reaction? A. There is a formation of a double tartrate of potassium and sodium. Of course, the starch remains in the residue.

Q. What elements neutralize each other there? A. The cream of tarter and the bicarbonate of soda.

The Court: What is the gas? A. Carbon-dioxide.

Q. The same is in the alum baking powder? A. Yes, sir.

Mr. Seddon: How much did you use in making a loaf of bread? A. That I cannot tell; my idea is that it same as the other.

Q. Have you ever found any other elements in it? A. No, sir.

Q. What is the residuum? A. The residuum is Rochelle Salts.

Q. That is an active cathartic, is it not? A. Yes, sir.

Q. Can you tell us now what it is? A. If I could tell you the proportion of cream of tartar and bicarbonate of soda I could tell you the absolute weights, but I do not remember the weights.

Q. About how many grains? A. I say I could not answer without knowing the proportions accurately. I think I can give you an approximate answer from the report of the Commissioner of Agriculture, which I have no doubt is substantially correct.

Q. That may refresh your memory? A. I do not know that the answer here will be in the exact form you want,

however. They are relative quantities. I do not think it gives the absolute amounts. If 184 grains of cream of tartar and 184 of bicarbonate of soda are used in baking powder there will be a residum of 282 grains of Rochelle salt. I have not verified it, but I have no doubt that is correct, and he calculates, I see, the amount that would give for a loaf of bread.

Q. How much would that be per loaf of bread? A. 165 grains of crystallized Rochelle salt in a loaf of bread made from a quart of flour or 45 grains more than is contained in a Seidlitz powder is the statement here.

By the Court:

Q. The weight of the loaf bread is not stated? A. It simply says a loaf of bread made from a quart of flour; it does not say what it weighs.

By Mr. Seddon:

Q. Are you able to say that is practically correct? A. Not from having actually verified it. I have been over the figures of the report formerly and where I have tested them they were correct. I presume it is correct, although I could not say positively.

Q. I will asume that. Have you made any investigation as to the wholesomeness of taking doses of Rochelle salts as a daily diet? A. Not from experiments of my own. I know from general reading and information of the character of such residue in regard to its effects. It is pretty fairly stated here. "The character of this residue is probably the least objectionable of any of those left by baking powders. Rochelle salt is one of the mildest of the alkaline salts. The dose as a purgative is from 1-2 ounce to 1 ounce. 'Given in small and repeated doses it does not purge, but is absorbed and renders the urine alkaline.'" That is a pretty fair statement of the facts.

By the Court:

Q. Would such an alkaline salt tend to neutralize the gastric juice? A. Yes, sir; I take it that the alkalinity referred to does not refer to the soda in the baking powder. It results from the oxidizing of the salt in passing through

the blood and passing out by the urine as chloride of potassium; that is a well-known fact.

By Mr. Seddon:

Q. You would not think it was a wholesome thing for children or grown persons to take it regularly in those doses? A. As is stated here it is the least objectionable residue that exists from baking powder. If frequent or abnormally large amounts were taken I naturally asume that it, like any other foreign substance, would be injurious and to that extent it would be objectionable.

Q. To the extent that it is a foreign substance? A. A substance of a very mild laxative character. I do not suppose that to have one go into the details of the effect of the alkalinity of the urine. In some conditions it might be beneficial and in others it might be detrimental. Where the tendency is to a deposition of uric acid in the urine alkalies are prescribed, and in an alkaline condition there is a tendency to the deposition of earthly matter.

Q. Are not Rochelle salts generally condemned by the medical profession as a purgative? A. No, I do not think that can be said; they are not as largely used as others, sulphate of magnesia and others; I do not know of any special condemnation of their use.

Q. Have you done any work for the Royal Baking Powder Company since 1888? A. No, sir.

Re-direct Examination.

By Mr. Cunningham: You have been questioned about the effect and wholesomeness of tartrates, I will ask you whether or not they occur in fruits? A. Certainly, cream of tartar is made from the juice of the grape, it is collected in connection with the after fermentation of wine.

Q. Now, when tartrates get into the stomach, or the system, through a baking powder, are you of the opinion that they would act either similar to or different from tartrates which had found their way there from the eating of fruits such as grapes? A. I know of no ground for drawing any distinction except in grape juice you are dealing with acid tartrate, or bitartrate of potassium, and so far as any

difference, I think it would be in favor of the normal tartrate rather than the acid.

Q. Are they digested or assimilated in a similar way? A. Yes, sir; I know of no essential difference.

Q. Do they take part in the process of digestion and assimilation? A. I do not know that they do, I do not at this moment see any direct effects to be attributed to them. Of course, the question is a very broad one. You would have to consider the effect of an acid tartrate or normal tartrate in the particular article of food. Probably there are some in which they would act, the acid tartrate might have some little tendency to aid in the alteration of sugars, but I do not think there is any very material part to be attributed to them.

Q. Are they oxidized and used in the system? A. They are oxidized producing carbonates, yes.

Q. To that extent are they real food? A. Yes, sir, to the extent that food serves the purpose of producing energy, producing heat, or mechanical energy, so far as they are oxidized they produce energy.

Q. That is true of all heat producing foods, is it not? A. Yes, sir.

Q. Carbohydrates? A. Yes, sir; certainly, carbohydrates do not exactly produce heat, they are capable of producing heat or mechanical motion by oxidization.

Q. And the tartrates are taken care of much the same way in the system? A. To the extent to which they are oxidized. They are already partially oxidized. By the fact that they are further oxidized they produce energy, either heat or mechanical motion.

ALBERT BENJAMIN PRESCOTT, sworn for the States, testifies as follows:

Direct Examination.

By Mr. Cunningham: Please state your full name? A. Albert Benjamin Prescott.

Q. Where do you reside? A. Ann Arbor, Michigan.

Q. What is your occupation? A. I am engaged at the University of Michigan as Director of the Chemical

Laboratory, Dean of the School of Pharmacy and Professor of Organic Chemistry.

Q. Of what schools, colleges and institutions of learning are you a graduate? A. I received a degree of Doctor of Medicine from the University of Michigan in 1864 and have received honorary degrees since that time.

Q. What honorary degrees? A. The degree of Doctor of Laws was the last degree conferred upon me.

Q. What has been you career or work and experience in the line of your profession and what offices or positions have you held? A. I have been engaged as a chemist and a teacher of chemistry since 1865. In chemistry my work has been in Analytical Chemistry, Organic Chemistry and Pharmaceutical Chemistry and Toxicology. I was assigned as surgeon in charge of hospitals in 1864 and 1865 of the United States Army. At the World's Fair at Chicago I was Judge for the Chemistry Manufacturing Department. I was elected president of the American Association for the advancement of science in 1890, and I am President of the American Pharmaceutical Association for the present year. I was engaged as a member of the committee of revision of the pharmacopoeia of the United States in 1880 with work upon Descriptive Chemistry and Methods of Assaying, and for the last eight or ten years I have been engaged in assisting a committee of revision of the United States pharmacopoeia by means of some investigations.

Q. Have you been an officer of the American Chemical Society? A. I have been a member of the Council of the American Chemical Society since its re-organization in 1890, and was at one time president of that society.

Q. Have your work and studies been directed to the subject of food and the adulteration of food to any extent? A. They have to a considerable extent in connection with my teaching, the teaching of chemistry in the School of Pharmacy and in the Department of Medicine, and in connection with my work as an analytical chemist and by reason of a special interest which I acquired quite early on the subject.

Q. Have you during that time kept yourself familiar with scientific literature on that subject, with treatises and published articles of leading scientists? A. It has been my

desire to do so; I have had an interest in so doing and have done so in some measure.

Q. What, if any, researches, tests and experiments have you made to determine the results or consequences of the use of alum in the preparation of human food? A. I have made analyses as desired from time to time, more formerly than in later years, of baking powders of all kinds, including the question of the presence of alum in baking powders. I have not made any experimental determinations of the physiological fact of alum on the living body although I have been a quite close observer of the results of such experiments as I could learn of them.

Q. What, if any, conclusions have you reached as to whether or not the use of alum in the preparation of food for man is wholesome and harmless? A. I have never reached a conclusion that it was wholesome and harmless. My first interest in the subject of alum in food arose about the time of the British law against adulterations of food and medicines in 1868, I believe, about that time, and frequent reports of the execution of law against the addition of alum to flour for bread making for some years following the period I have just mentioned, the means of detecting alum, not then as a constituent of baking powder, and ever since the use of alum in baking powder has gained attention I have been interested in all that was presented on the subject as far as I had time to learn of it.

Q. You say that you have never come to the conclusion that the use of alum in the preparation of food is wholesome and harmless; have you come to any other conclusion on that subject? A. Quite so.

Q. Please state what that conclusion is? A. It has been and remains my conviction that alum is not a suitable constituent of food to be called a food, and that its use in baking powders, though not open to the full measure of objection that applies to the addition of alum alone not neutralized, is still open to a measure of the same objection.

Q. Please state, if you can, whether or not there is a uniform, common consensus of medical men and scientists that alum used in the preparation of food is wholesome and harmless? A. There is not an entirely uniform agreement of opinion upon that subject. A dissent has arisen quite

recently, comparatively recently, in the case of alum as a constituent of baking powders. I should speak of it, as I think of it, however, as a dissent from the prevailing substantial, sanitary opinion of scientific men in Europe and in this country.

Q. Do you speak now of the dispute or dissent from the general opinion that it is harmful, or do you mean that the dissent is from the general opinion, that it is harmless? A. I mean the former, a dissent from the general opinion that it is injurious, a dissent from the nearly unanimous opinion as applied to alum alone, that it was harmful in bread, and, in my judgment, it is a dissent from the prevailing opinion at the present time that alum is injurious as a constituent of baking powder. In other words, I believe the majority of sanitary opinion—that is the way I have looked upon it. It has been my impression and still remains my belief, that the majority of the opinion of scientific men over the world is against the admission of alum into baking powders, as it is even more strongly against the use of alum alone in bread or other foods. That weight of opinion, I judge, is stronger in the weight and majority in Europe than it is in this country, at last I have looked upon it as such from my reading of hygienic journals and publications devoted to the analyses of foods, to standards of purity of food in continental Europe, in England and in this country.

Q. Have you read, or heard read, the depositions of Dr. Ernest E. Smith and Dr. Austin Flint, given in this case? A. I have read them, I have not heard them read.

Q. What, if any, criticisms have you to make upon the method of their experiments and the conclusions they have reached from those experiments? A. This criticism, that is a guide to my own judgment in the matter: their experiments were too few in number to cover the whole case, and that the process of digestion is dependent upon so many factors that we could not reasonably expect that by controlling a single factor in a few experiments to determine the actual influence of that factor. If digestion and health depended on nothing else but the presence and absence of alum in baking powder, or the bread with which it is made, it would be reasonable to draw the conclusion which they have drawn. Sanitary law has to accomplish the preserva-

tion of health through a great many safeguards and we cannot expect that good digestion and good health will turn wholly upon one safeguard or one factor.

Q. What do you say to the proposition and statement of Dr. Smith that alum or its constituents are found in almost all drinking water? A. I have made many analyses of water for mineral constituents and obtained the making of such analyses by others competent to make them in my own laboratory, and upon looking over all of these analyses, so far as I could reach them, and studying the subject somewhat, I can only say that alum or aluminum compounds exist in natural drinking waters, only in traces. I mean by drinking waters such as are neutral and not charged with excessive acid in addition to other properties of potable waters. The nature of alum as a metal in combination is such that in the presence of chlorides aluminum salts cannot remain in solution in free flowing waters or the water of a lake.

Q. Do you speak of aluminum chlorides or aluminum carbonates? A. I say aluminum salts in the presence of chlorides. If we had in water aluminum salts in the presence of a chloride or a bromide, the result is substantially of aluminum chloride itself. The aluminum reacts as though it was in some proportion present as a chloride and becomes a basic salt and a more basic salt until it is practically aluminum hydroxide, so that in natural waters, as in the water of Lake Superior and the other Great Lakes, we can have in the nature of things scarcely any more aluminum salt—not salt, but a compound, scarcely any more aluminum compound in solution than the quantity of aluminum hydroxide itself which can be dissolved in the more or less saline waters. I find that in the ocean itself aluminum is counted by analysts as one of those elements present in traces along with silver and gold and lead as in smaller proportions than manganese, a proportion too small to be stated quantitatively. The water of the Dead Sea contains but 13 grains per gallon of aluminum salt, but that is not a neutral water, it is an acid water, and the waters, natural alum waters, are not neutral but aciduous. I had some years ago, a very careful quantitative analysis made of the waters of Lake Superior, I must confess, however, that I presume it

to be somewhat defective. The water was brought to me in a glass carboy and I cannot beclare that it was free from the addition of aluminum compound. 40-100 of a part per million was the quantity found in that analysis. I think one part of a million of aluminum oxide or hydroxide is about as much as any of the natural waters contain. Detroit River water was analyzed in my laboratory some years ago and was reported by myself and another analyst as only containing traces of aluminum.

I collected, some months ago, as many as I could of analyses of the natural waters of the State of Michigan, which had been made in my laboratory, and they have been published with others and some sanitary analyses by Dr. Vaughan in a recent issue of the United States Geological Survey, and, in looking over those analyses within the last few days I am unable to find any record of aluminum in larger proportions than those mere traces which I have named. Of course the rocks upon which natural waters rest, and that is especially true of the waters of Lake Superior, are rich in aluminum compounds, in the rocks and minerals. The waters are in contact with clays and other natural silicates. There would be aluminum salt in natural waters, I am sure of it, in greater quantity than there is if it would stay there when once it is introduced there. In the nature of things it deposits as a sediment if the water be neutral. If the water were absolutely free from chlorides there would not be as much certainty of the deposition of aluminum, but I hardly know of any natural waters that are entirely free from chlorides.

Q. When a baking powder containing alum is used, are the aluminum compounds left the same in all cases? A. They are not the same under different conditions with the use of the same baking powder, not entirely the same. The alum of one alum baking powder contains as we are saying over and over again an acid in combination with the aluminum, an acid that has power to serve as an acid in liberating carbonic acid from bicarbonates. Now, the sulphuric acid of aluminum sulphate or of alum is taken up into combination by the alkali of the alkali carbonate, gradually, not suddenly and completely. The first result which may be noted, or may not, but is logically the first result, is a

taking away of a part of the sulphuric acid from the sulphate of aluminum, I mean from each molecule or ultimate part of the sulphate of aluminum, a portion only of the sulphuric acid is at first removed so that the result is a basic sulphate of aluminum, and then a further portion of the acid is taken up and we get a more basil or basic salt of aluminum, and if the amount of alkali or alkali carbonate be sufficient and the contract extended long enough we get pure aluminum hydroxide from the combination of all the sulphuric acid with the sodium or other alkali. This forming of basil carbonate is liable to be arrested before it is completed, that depending upon the conditions, upon the concentration of the alkali which is employed. All authorities on analytic chemistry caution the analyst against neglecting the liability to the formation of basic salts, when a solution of aluminum salt is treated by the addition of a solution of sodium bicarbonate or other alkaline carbonate, special precaution must be taken to remove all sulphuric acid in combination with aluminum and to give by persistent treatment the pure aluminum hydroxide. The student is very liable, in his first operation undertaking, to precipitate aluminum hydroxide and weigh it as such, he is very liable to leave behind some of the acid, especially if it be sulphuric acid, and weigh a basic salt of aluminum instead of aluminum hydroxide, so that he is cautioned to test the filtrate after further treatment with alkali or alkali carbonate in order to find whether any portion of sulphuric acid or other acid had been still left in combination with the aluminum. This liability to the formation of basil salts renders alum as an acid a somewhat too uncertain quantity to be a satisfactory and safe acid in use with sodium bicarbonate in a baking powder even if alum were open to no other objection.

Another case of variation in the chemical change that occurs when the baking powder is wetted is this, that if the baking powder be wetted in mixture or contact with the non-volatile organic acids, lactic acid, tartaric acid or citric acid neither alkalies nor the alkaline carbonate will fully precipitate the aluminum, and if such acid be present in sufficient quantity and the solution be sufficiently dilute, the whole of the aluminum may remain in solution as a

double salt and the solution from those alkalies cannot precipitate it. Sugar, as was regarded at an earlier period in all of the dictionaries of chemical solubilities was stated to be a solvent for aluminum hydroxide, and other carbohydrates have the same power to dissolve it, when once it is formed and a greater power to prevent its precipitation. Carbondioxide of course is evolved just as fully with the aluminum hydroxide as without, but this liability to solution, a somewhat permanent solution of the aluminum hydroxide, is another variable factor in the use of alum baking powders, and it is one of special importance, because, so far as it has come to my knowledge, the use of alum baking powders has been only defended upon the ground that the aluminum goes into an insoluble precipitate in the reaction of baking powder and therefore becomes inert and harmless.

I hardly know that I have seen or heard a defense of baking powder that was not dependent mainly, as it appeared, upon the idea of the aluminum going into an insoluble combination as a result of the action of the baking powder. This solubility of aluminum hydroxide in lactic, tartaric and citric acids, sugar and other carbohydrates is stated in all the books upon analytical chemistry, in qualitative analyses with which analytical work begins, and is constantly before workers in analyses, teachers and students, and there can be no mistake about it. It is verified over the world in every analytical laboratory.

Q. Will you state the mechanical and physical properties of aluminum hydroxide? A. Aluminum hydroxide as a recent precipitate is a gelatinous and very bulky precipitate. It is so gelatinous and so bulky that it is quite a remarkable example of a jelly like, or to use a term in physics, a colloidal substance, one the opposite of a crystallizable or crystallized substance, one which has enormous surface and bulk and tends to spread through any mass with which it is mixed over, any surface with which it is in contact, and so become mechanically disseminated to an unusual extent. It has great adhesive power. The use of aluminum as a mordant is another illustration of this same remarkable adhesive power of aluminum hydroxide and other compounds of aluminum, and this property corresponds and agrees

with the very slight power of aluminum to pass through membranes by diffusion regardless of the gravity of its weight, pass through animal membranes or other porous membranes. The same quality of aluminum and its compounds generally, in some compounds more decidedly than in others, the same quality renders aluminum salts difficult and slow to pass through membranes, slow to be absorbed into the tissues of plants growing in aluminous soils, and slow to be absorbed through mucous membrane when aluminum compounds are taken into the stomach and intestines. The vegetable and animal kingdoms both seem to be fenced against aluminum although the fence is not imperviable as aluminum does pass through membrane but very slightly and very slowly. It seems to me that animal membranes have more power to admit aluminum than vegetable membranes do, or perhaps in the case of a plant the rejection of aluminum is not due entirely to physical inability of the aluminum compound to go through the tissues of the plant, but due also to some selective power of the plant which I could not explain, but which we must recognize as in the power of plants, to select potassium compounds and reject sodium compounds when both potassium and sodium are equally abundant in the same soil and when they do not differ very much in the mere physical power to pass through membranes. At any rate considering the abundance of aluminum in soils, next to silicon and oxygen, the most abundant in soil or the crust of the earth, it is remarkable that we do not find statements of the presence and percentage of aluminum in the ash of plants, at all events of flowering plants.

Q. In what contents of the human stomach is hydroxide of aluminum soluble? A. It is soluble, measurably so, in hydrochloric acid, in lactic acid, in any acids which are introduced into the stomach and alimentary canal as foods, if such be acids forming soluble aluminum salts, as do most of the acids of fruits, and to some extent even in sugars. How far sugars are liable to be concentrated enough in the digestive tract to dissolve an aluminum hydroxide after it is precipitated I do not know. I would not undertake to declare, but I could not deny but what some measure of aluminum hydroxide might be dissolved in sugar. I should not have much confidence in it being dis-

solved in sugars ordinarily present—in the concentration ordinarily present in the digestive tract, but I have no doubt that when aluminum hydroxide is once dissolved in the stomach by acids found there, that sugars would prevent its re-precipitation by the alkaline reaction of the duodenum, of the intestines lower down.

Q. How would the effects of such a solution compare with the effects of a solution of alum? A. Do you mean the physiological effects?

Q. Yes. A. They would be, to all intents and purposes, the same. There is no reason that I know of to attribute any special difference, any marked difference of physiological action between one aluminum salt and another as they act in the digestive tract.

Now, I do not deny that aluminum acetate, if you have it clear and by itself, nothing else with it, has a somewhat different physiological effect undoubtedly from aluminum sulphate. However aluminum acetate would have the same effect as aluminum sulphate on the general influence on the system after absorption, the same, or nearly the same, but when I say that these different salts of aluminum formed by dissolving aluminum hydroxide in different acids which it might meet with in the digestive tract, are substantially the same in physiological effect, I have in mind that we do not expect much physiological effect from any aluminum salt unless it be dissolved in a liquid state in the alimentary canal and if it be dissolved in a liquid state it is one of the different metals or bases in the liquid contents of the stomach and intestines all of which are in combination with the acids, or the acid radicals of the same stomach and intestines, and no one can say in what proportion the different bases divide themselves with the different acids. If this aluminum salt of any kind, any aluminum salt, be in a stomach, and if sodium sulphate be introduced into the stomach then aluminum sulphate is qualitatively present in that solution. I consider that perfectly certain, in fact the metals of all sorts in a given solution are, as chemists now say, in the ionic state, they are separated and not immediately united with their acids. That is shown by the effect of electrical conductivity and no one can say how aluminum and sodium and calcium, if all be present in the stomach, will pair off

with sulphuric acid and chlorine and radicals of lactic acid if their salts are present in the same digestive tract. Strictly speaking we would say they are not paired off at all while they are there in solution and how they would pair if they were thrown out of solution would depend on conditions too complex to predicate.

Q. If a chloride of sodium and sulphate of aluminum are in solution together what is the relation of those two salts, the chloride and sulphate? A. If I have been able at all to make myself clear in this matter, which I fear is a little difficult to state, both metals are chlorides in some proportion and both metals are sulphates in some proportion.

Q. When a baking powder is used and bread eaten, what substances, if any, have the power to interfere with the precipitation of aluminum hydroxide by the bicarbonate of sodium? Have you fully answered that question? A. I think I have answered that as fully as I can.

By the Court: As I understand you, your explanation is that the aluminum hydroxide was precipitated by the bicarbonate of sodium in the mixture of the bread and during the process of baking and is complete at the time the baking is concluded and before the introduction of the food into the stomach, is that correct? A. Liable to be complete if there be sufficient—

Q. So far as the original quantity of bicarbonate of soda in baking powder could perform the work? A. Well, I am not quite sure of that. I would not like to deny but what it may be so, but, of course there is sugar in the bread to some extent, a small quantity; there are carbohydrates and there is moisture, and whether even in the crumb of the bread the substances which prevent the full precipitation of the aluminum hydroxide by the action of the alum on the alkalies in the crumb of the bread prevent that precipitation or not, I do not know, I think they are liable to do so, I cannot tell how far.

By Mr. Cunningham: If all the aluminum existing as an element in an alum baking powder were converted into aluminum hydroxide how much in weight would be obtained

from 200 grains of 20 per cent. alum powder? A. 200 grains of 20 per cent. alum powder would contain 40 grains of alum, and about one-third of that quantity would be the weight of the aluminum hydroxide.

Q. That would be about 13 1-3 grains? A. 13 1-3, we might say 13 grains, the factor is not just 3, the divisor is really 3.1, I think.

Q. It would make about 13 grains? A. About 13 grains of aluminum hydroxide.

Q. What would be the mass of this powder in appearance? A. Well, 13 grains, almost one gramme, of aluminum hydroxide as a recent precipitate fills up the filter pretty well, I do not know as I can state it in description. It is quite a large mass.

Q. Would it be much larger than a grain of wheat? I ask that question because in his testimony Dr. Keiser said he thought the bulk of 10.17 grains of aluminum hydroxide would be between the volume of a pinhead and a grain of wheat. Now, I ask you to make your comparison with that volume when you are speaking of the recently precipitated 13 grains of aluminum hydroxide? A. I heard the statement as made by Dr. Kaiser. I thought at the time he must mean aluminum oxide, Al_2O_3, such as would be obtained by igniting aluminum hydroxide and even then it seemed to me a statement of a small bulk or volume. I should say, however, that aluminum hydroxide, when first precipitated is so very bulky and it may lose a great deal of bulk in drying at or below the boiling point of water without chemical change without losing any water or hydroxyl of combination.

Q. Do you think the reduction of bulk by that temperature of 212 degrees Fahrenheit or 100 degrees Centigrade would reduce the volume of 10.17 grains to anything like the bulk of a grain of wheat? A. It seems to me not.

Q. How much mucous surface would 13 grains of recently precipitated aluminum hydroxide tend to cover? A. Well, I can only say comparatively a large quantity in accordance with what I have said already about it, a large surface.

Q. You have already stated, I believe, that its tendency would be to spread through the contents of the stom-

ach, if there? A. By reason of its bulkiness, and spread over a comparatively large area of mucous surface for the same reason of its exceeding bulkiness.

Q. Is aluminum hydroxide a medicine? A. It is so classified officially, being an article of the United States Pharmacopoeia introduced in the last revision, that of 1890, from the German Pharmacopoeia to meet the demand of German physicians in this country who have been in the habit of using it more or less in practice as an article of their home pharmacopoeia. I do not know how long it has been official in the German Pharmacopoeia, but for quite a long time, I think.

Q. Has its effect upon the normal action of any digestive ferments been determined by experiment? A. These effects have been the subject of experiment and as the result of these experiments—

Mr. Seddon: One moment, if you will excuse me. Will you ask him if those are his experiments or the experiments of some one else?

Mr. Cunningham: I really cannot answer that in advance, I do not know what he is going to say in answer to my question, I have no right to assume what it will be.

Mr Seddon: May I ask him that?

Mr. Cunningham: I think the only way is to object to the question or not object.

Mr. Seddon: I object to the question.

The Court: The objection will be overruled, I think it is apparent that the witness is stating this as a matter of scientific information.

The stenographer reads the last question and answer.

The Witness (continuing): It has been determined that aluminum hydroxide has considerable antiseptic and anti-digestive power to inhibit or prevent the action of pep-

sin, or the action of diastase pepsin being the chief digestive agent of albumenoid food in the stomach, what we generally speak of as pepsin, and diastase representing the agent for the digestion of starchy food in any part of the digestive tract. These determinations as I found them in published reports of some experimentors seemed to coincide with what is known of the character of aluminum compounds. I have no reason to doubt them. We know that aluminum compounds in solution have a considerable measure of antiseptic and anti-digestive power. I say anti-digestive power because if I am not mistaken that is always my view of the case, any antiseptic is necessarily more or less an anti-digestive, digestive changes may be classed among fermentive changes, and are inhibited by like agents, so when I speak of the power of aluminum compounds to retard or even prevent digestive changes I am not thinking so much of testimony which I may have heard brought forward in this case regarding the alum in baking powders and its effects upon the digestion of bread, as I am thinking of the knowledge of the entire scientific world as to the antiseptic and inhibitory power of all the aluminum salts upon all fermentive, digestive and putrefactive changes in a greater or less degree without exception.

Q. For what effect has alum been used when added alone to bread by bakers? A. It is a matter of very common knowledge among food chemists, especially in the '60's and '70's of this century, that alum is used to harden or stiffen the gluten of flour, to correct the weakness of flour which has suffered from a bad harvest or the weakness of a flour which is deficient in the quality or quantity of gluten, so deficient as to be unable to make a fully porous bread sponge and light white loaf of bread, unable to make a large loaf of bread from a given weight of flour and to enable the loaf of bread, also being more porous to take up more water. This is the effect of alum as I have understood upon the so-called gluten, the proteids of albumenoids of the wheat, that part of the wheat grain upon which the flour is entirely dependent for making a porous sponge of bread. This hardening or firming of the gluten of the wheat by the action of alum is in accord with the great adhesive power of the alum as a colloidal substance and somewhat in accord with

with its antiseptic and preservative power, in fact the antiseptic or preservative power of the alum in that case was effective directly in arresting the further changes in wheat which had been sprouted, without doubt in addition to its service in constraining the gluten of a given quality, and doubtless serves to prevent further changes of gluten in some cases.

Q. And it is your opinion that this effect in bread is of a kindred nature with the effect on digestion in the stomach? A. It is entirely so.

Q. You may have indicated generally, but at the risk of repetition I will ask you what powers have alum and aluminum salts to pass through membranes? A. Well, when an alum is dissolved and floated upon a quite close animal membrane, like that of the bladder of an animal stretched over a hoop, or that of closed parchment paper, in either case called a dialyzer, the sulphate of sodium, or if it be potash alum, the sulphate of potassium, dialyzes through the membrane; this membrane being floated upon pure water it will be found that the pure water on the other side of the membrane becomes gradually charged with the sulphate of the alkaline metal, the sulphate of the potassium, the sulphate of the sodium, or if it be ammonia alum the sulphate of ammonia. My own work has been more with potash alum, but I have worked enough to know that alums all act about alike in that regard.

Now, that is a disassociation of a part of the alum as a double salt, a considerable part of the alum ceases to be a double salt, one salt goes through the membrane and the other is left behind, the sulphate of aluminum passing through very slowly and very slightly, but the sulphate of aluminum does pass through. I never was able to get with the closest dialyzer pure sulphate of potassium free from any aluminum salt or pure sulphate of sodium free from aluminum salt by dialysis, it is a question of difference of degree of diffusion through the membrane, and that is true of different membranes, porous animal membranes, parchment paper and porous porcelain.

Q. I understand you as to this particular matter to have stated not only your general knowledge, but your knowledge derived from actual tests and experiments of your own?

A. Yes, sir; in 1864, while I was a medical student, I worked with great enthusiasm upon this matter of dialysis then recent from announcement from the English chemist Graham, and I labored very faithfully in undertaking for several months to obtain, if possible, pure potassium sulphate from aluminum salt by dialysis and never got the aluminum salt all out. Another matter of considerable interest concerning the general character of aluminum salt is what appears in dialysis of aluminum salts as is well known, when certain aluminum salts are floated upon a dialyzer in this way the acid aluminum salt diffuses through the membrane to a greater extent, the salt becomes basic more rapidly if aluminum chloride than if aluminum sulphate, but it becomes basal in both cases. It becomes so basal in diffusing through the acid that in ordinary conditions it would not be soluble, yet in that peculiar condition which was discovered for aluminum and some other elements, by Graham in England the exceedingly basal aluminum salt remains in a frail state of solubility, a liquid state, which may continue for days or even weeks and at any time may be suddenly converted into an insoluble state. It is the frail and peculiar state which is known to physicists as a soluble colloidal state, or a peptonic state and it belongs only to substances of remarkable adhesive power.

By the Court: What is the action of acetic acid on aluminum hydroxide? A. Acetic acid dissolves aluminum hydroxide quite readily, nearly every salt of acetic acid is soluble. It forms soluble salts very generally, but aluminum acetate tends to gradually give off acetic acid if it be exposed by vaporization.

Q. If a person should, at a meal, use hydroxide of aluminum together with other foods which are made sour by acid, such as lemon juice or vinegar, would those acids assist in dissolving the hydroxide? A. The acids would neutralize themselves with the hydroxide of aluminum nearly to completion, leaving generally a slight sense of acid, I do not know but under some circumstances the aluminum hydroxide would take up almost the last traces of acid. Whether it would or would not leave slight traces of acid would be a matter of condition, which I would not like to declare, but as a general rule, acetic acid, the citric acid of the lemon,

or the tartaric acid of the grape, would be neutralized by the aluminum hydroxide of baking powder. Now, I do not forget that the aluminum hydroxide of baked bread is not a recent precipitate, that it has been baked in an oven, that it has not lost the water of combination at all, but still it has lost a measure of the water mechanically combined and held by the adhesion of the aluminum hydroxide which has been exposed to near steam heat and is not as bulky as it has been before. That quality of bulkiness of the recent precipitate of aluminum hydroxide tends to make it easily disseminated through the bread and spread over the larger internal surfaces of the mass.

By Mr. Cunningham: Describe the recently separated hydroxide of aluminum in the state which I believe you defined as a colloidal solution; I will ask you if that state is a good one to resist solvents, or on the other hand, is one that readily yields to solvents? A. It is one exceedingly favorable to the action of solvents, because it is one of great porosity.

Q. Now, the walls of the alimentary tract, I understand, are membranous, or are membranes in the sense you have been speaking of, the media through which substances will pass or not pass, is that correct? A. It is, I think.

Q. What becomes of the aluminum salt that does go through the mucous membrane of the stomach and intestines? A. It goes into the general circulation of blood, going around the body every two, three or four minutes.

Q. What has been found to be the effect of aluminum salts in the blood? A. It has been found that when aluminum salts are introduced into the blood in quantity sufficient to have a marked effect, that such effect is a specific characteristic of aluminum salts as a physiological effect, or effect peculiar to aluminum salts on the blood in general circulation and markedly distinct from the effect of aluminum salts upon the mucous membrane of the alimentary tract. Upon the mucous membrane of the alimentary tract aluminum salts or aluminum compound as an aluminum compound, the effect is astringent, to mildy or to violently irritate it according to its concentration. Aluminum hydroxide is rated in the pharmacopoeia as a very mild as-

tringent, used as an astringent. In greater concentration the astringency becomes so decided as to become an irritation, and alum or alum salts are rated as irritant agents or even spoken of when in excess as irritant poisons in the alimentary tract. One of the specific effects of aluminum salt introduced into the blood, an effect which is common to aluminum salt, the mildest and least irritative acid in combination there with aluminum lactate or aluminum acetate, a double tartrate, is a specific effect which is found to produce a train of symptoms the same as in different animals.

One of the marked characteristics of this effect is that although aluminum salt be introduced into the general circulation, it tends most strongly to be excreted through the bowels, through the stomach and bowels. It is thrown out from the circulation into the alimentary canal more largely than in any other way. It is excreted through the mucous membrane of the intestines much more than by the kidneys, but the most marked characteristic of this effect of aluminum salt on the blood as a poison, is its effect on the nervous centers, producing some kinds of paralysis of the nervous system when applied to different species of animals, some degeneration of the tissues besides degeneration of the nervous tissues. This degeneration of tissues has been studied as specific effects and found, as I said, to be markedly characteristic of the effect of this poison. These decided effects so marked as to show to the observer in the result of the degeneration of tissues, to tend to death and even to reach death, are seldom obtained in experimentation from the absorption of aluminum through the mucous membrane. It does not seem rapid enough to cause the physical effects which enables the observer to trace the exact degeneration of tissue produced. I believe there have been a few instances reported of fatal results on animals by administering it internally, that is into the stomach through the mouth, but on the other hand, there have been quite as many, and my impression is more, instances where decided poisoning was not obtained by the introduction of aluminum salts into the alimentary canal of animals. There is reason for that, however, that the aluminum salt is so strongly irritative that it will be rejected by vomiting or purging or both, so that it is no wonder that the noted toxicologist, in his early in-

vestigaiton of the subject, very early—I may be wrong about the date, I think it was in the '20's, tied the esophagus of animals in order to retain the alum, and in that way obtained fatal results. While the animal was free by vomiting or purging to reject the poison applied in very large doses, fatal results were not obtained.

By the Court: Speaking of the effect of alum or its compounds introduced in the circulation, I presume you refer largely to the experiments which were made by artificial injection, such as injection into the venous system? A. I do, those experiments made with lactate of aluminum and sodium and tartrate of aluminum and sodium on some animals. I have paid much respect to them especially because I had great confidence in the ability and judgment of Kobert who directed them at the University of Dorpat in the first instance, and who has reported upon them as they were made elsewhere.

By Mr. Cunningham: Is Kobert recognized as a very high authority upon such matters? A. I look upon him, as taken all in all, the highest authority upon the physiological effects of poisons in the world for some time past, what are commonly called poisons. He has not devoted so much attention to the physiological effects of common medicinal agents, perhaps, as some others, though he has covered much of that as well. Kobert has been associated in most of his work with Schmederberg, who is equally as high an authority. Both were in the same university for some time, and Schmederberg directed his attention more specially to the exact tracing of effects of medicine, ordinary medicinal agents, upon the living body, and Kobert, to tracing the effects of poisons as such, though the same articles were used as medicinal agents.

Q. Is alum found, so far as you know, or are informed, in any natural food product, by which I mean grains, or fruits or meats used as food by man? A. Well, hardly to my knowledge, or to not more than traces. The flowerless plants are reported to contain some aluminum compound as one of the ash constituents, some of them, of the lycopodiums. I have been very watchful of this question of the

presence of aluminum compounds in the ash of wheat. It has struck the chemical world somewhat with surprise that reports of even minute quantities should be made as to the presence of alum in the ash of wheat, I have no personal knowledge of the subject, but it certainly seems to me without question that if aluminum be present at all as a strictly organic constituent, the constituent of the ash, aside from extraneous sources, it must be in very small amounts, or it could not have escaped detection so long. It could not be a matter of so much dispute and doubt among analysts at the present time if it were in any appreciable portion in the ash of the wheat. I have read the report of the English chemist who claims to find aluminum to some slight extent in wheat, and to find that so far as it is in the berry of the wheat it has its seat in the gluten of the wheat. I am not able to criticise that report with any certainty myself, and I can only say, as I perhaps have said, that it is practically certain that it cannot be for flowering plants a regular constituent of the ash, or it would have appeared in the reports of analyses long since and many times. I have quite recently looked through tabular statements of analyses of the ash of several kinds of grain and other agricultural products and I find seldom any mention of aluminum, and if so, it is in traces.

Q. There has been some question as to whether the tartrates getting into the stomach are digested and assimilated: what can you say on that subject? A. Well, the subject of acids of fruits has been rather a hobby of mine, entirely and utterly aside from this question. Most of our fruit and vegetable acids are important food constituents, citric, tartaric and malic acids. Now, these acids for the most part are not uncombined in fruit, not wholly so. They are salts of citric and tartaric and malic acid to a considerable proportion. When taken as food the acids are oxidized in a similar way that sugars and starches are oxidized, and the result is heat and energy in proportion to the quantity of organic matter they contain in the same way that it is for starch and for sugar and for fat. So far as these acids are salts of sodium and potassium, more generally of potassium than of sodium, or more largely of potassium than of sodium, they are converted into carbonates of potassium

and sodium, which are alkaline in effect, so that as far as these acids of fruits and other vegetable foods, even besides fruits, acidulous foods, they furnish alkali to the system. Of course this is taken note of by physicians in advice to patients and to people in health who are prudent enough to consult with physicians as to the food best adapted to their several states of body, not always, that the introduction of alkali as the result of the oxidization of the salts of the fruit acids is advantageous to the system, not always, but on the whole; I believe that fruit and the acidulous parts of plants are a very valuable element of food. They serve a purpose doubtless in the digestive tract besides their effect in the system. I am not able to explain this effect, but I recognize more from non-professional knowledge than from professional knowledge the value of acidulous foods, the necessity of vegetable acids to mankind and the injury which soldiers and sailors often suffer, the conditions designated under the head of scurvy, from the deprivation of those kinds of vegetable fruit of which the acids form a considerable part.

Q. Then will you state, in general terms, whether or not you consider the addition of tartrates to food desirable and healthful? A. I do for most people, for people at large. They form, however, a certain class of foods which perhaps cannot be taken as generally and as universally as some other kinds of foods. I may not be right about that. It is hard to specify any kind of food which is adapted to all people. I know some persons who have very great difficulty in appropriating butter and other fats and digestive difficulty in consequence. Still I have been in the habit of thinking of acid fruits as being food to take advisedly rather more than universally. They furnish energy and heat, however, as true foods, and whatever medicinal effects they have is another matter that is due to taking them in such large quantities or such ways as to produce marked effects different from those obtained in ordinary foods. We may take Rochelle salts the normal tartrate of potassium or bitartrate of potassium on the advice of a physician for a specific purpose, and we take them as the constituent of the grape forming 1 3-4 to 2 per cent. of that fruit. When we take them as a constituent of fruits we take them in quantities and in ways so that their ordinary effect is more largely that of a food than that of a remedial agent.

At this point the Court adjourned until 10 a. m., February 10, 1900.

On February 10, 1900, the Court met and the hearing of the case was resumed.

Mr. Cunningham:

If your Honor please, there are three or four questions which on reflection I will ask leave, although I stated closed the direct examination last night, to ask Dr. Prescott.

The Court: Proceed.

ALBERT BENJAMIN PRESCOTT further testifies as follows:

Direct Examination.

By Mr. Cunningham: Do the residues left in bread by alum baking powders serve any useful purpose in the animal economy when such bread is consumed by human beings? A. They do not any that I know of.

Q. Do you then consider alum baking powders healthful and harmless when used in the preparation of human food? A. I do not.

Q. Do the residues left in bread made with cream baking powders serve any useful purpose in the animal economy, when such bread is consumed by human beings? A. I believe those residues do serve a general, useful purpose in animal economy, as explained already in the testimony I have given.

Q. Are the residues left in bread made with cream of tartar baking powders harmless and wholesome constituents of human food? A. They are.

Q. Do you then consider cream of tartar baking powder healthful and wholesome when used in the preparation of human food? A. I consider them healthful constituents of food, for entering into healthful forms of food. I know of no one form of food that is equally adapted for all people under all circumstances.

Cross-examination.

By Mr. Seddon: You are professor of chemistry at Ann Arbor University? A. Yes, sir; of Michigan.

Q. Are you very actively engaged there in the conduct of that department of the University? A. I am, sir.

Q. What are your daily duties, not specifically? Do you lecture almost daily? A. I lecture daily five times a week when not interrupted, on organic chemistry, and I have duties of administration.

Q. Have you a large laboratory connected with your department? A. There is.

Q. You have quite a corps of assistants there, have you not? A. Yes, sir; I have, sir.

Q. You are daily engaged in the administration of that laboratory are you not, in supervising its work? A. I am, sir.

Q. You are conducting all kinds of experiments there continually, which you supervise and look after with your force? A. I have some charge of experimental work.

Q. Well, you are equipped there to carry on those experiments, both with reference to apparatus and with reference to assistants, are you, not, fully equipped? A. Fairly well equipped, I hope.

Q. Well, it is considered one of the best equipped institutions of the kind, is it not, in that direction? A. The university has a good standing for laboratory equipment, although we should like better equipment and are continually improving it.

Q. When was your attention first called to this case, Dr. Prescott? A. In the Christmas holiday time when I was ni New Haven attending a meeting of chemists, my attention was called to it by Dr. McMurtry.

Q. Who is Dr. McMurty, is he the gentlemen who has been in Court throughout the case at the elbow of counsel for the state? A. He is the gentleman who sits now in Court.

Q. How long have you been acquainted with Dr. McMurtry? A. I cannot say precisely how long, I knew him first and entertained him at my house about the middle of the eighties, I think; I believe it was while he was still

professor of chemistry in the University of Illinois, or perhaps it was shortly after he left there, I am not quite certain.

Q. Have you been on very friendly relations with him ever since? A. Quite so, I have been acquainted with him and have met him at meetings of chemists from time to time.

Q. He is a personal friend of yours, is he not? Would he not be so considered? A. Yes, sir; he is a personal and professional friend to some extent.

Q. Now, what work have you done in this case in the way of assisting Dr. McMurtry and the counsel, have you had any conversations with them, if so, how many? A. I have been inquired of in consultation by Dr. McMurtry a number of times, upon certain points in the case, as to my opinion as to certain questions connected with the case.

Q. Well, you were here once before when this case was on trial were you not? A. I was, sir, yes, called to give testimony then.

Q. How long were you here then, Professor? A. Several days.

Q. Were you in constant association with those gentlemen during that period just referred to, the counsel and Dr. McMurtry? A. I was in frequent conversation with them.

Q. You were at the same hotel with Dr. McMurtry? A. I am.

Q. You were at that time? A. I was at that time.

Q. You were talking over the case and conferring with them as to the points that could be made that were favorable to that side, were you not? A. Sometimes, yes sir; we did not have a great deal to talk about, the time was hanging rather heavily on our hands.

Q. Professor Mallet, I suppose, was there conferring and talking with you about the various points of the case, was he not? A. I think I have heard Professor Mallet—

Q. I am speaking of when you were there.

Mr. Cunningham: Let him answer. Go on Doctor.

The stenographer reads the last question and the answer of the witness.

The Witness (continuing): Conversed with Dr. McMurtry about some points in the case from time to time when I was here before, and while I have been here this time.

Q. Were not you, Professor Mallet, Dr. McMurtry and counsel in conference together discussing the case, one making suggestions and the other making suggestions, with reference to a line of proof? A. At some times.

Q. At times? A. At times, not constantly by any means.

Q. Well, I suppose of course, you receive compensation? A. I expect to receive compensation.

Q. Have you any arrangement with reference to your compensation? A. Only this, that when Dr. McMurtry in New Haven asked me if I could come to St. Louis and give testimony if I should be wanted, I said I would try to do so if it was at a time when I could arrange my duties and leave my work at the University, and provide for it, I would come at my usual compensation at a rate per day and expenses.

Q. Well, what do you mean by your "usual compensation?" A. One hundred dollars a day when I go some distance from home and in a case of responsibility.

Q. What is your age Doctor? A. I was sixty-seven years of age last birthday, last December.

Q. And you did so arrange your business to be here on the two occasions that this case was set? A. I was able after communicating several times, to arrange so that I could come.

Q. Do you know who Dr. McMurtry is in relation to his business connections? A. I believe his business in part is as a chemist of the Cream of Tartar Baking Powder Co.

Q. You mean the Royal Baking Powder Co.? A. The Royal Baking Powder Co. I do not know that I have the firm name exactly right. I have never had occasion to verify it or remember it.

Q. Well now, have you had occasion to appear on behalf of the same gentleman at any other time on this question, before any other commission or court? A. I have not.

Q. Did you appear before the pure food commission in Chicago? A. I did sir, I appeared there on my own behalf.

Q. You say you appeared there on your own behalf, what do you mean by that Doctor? A. I mean that I appeared there at the request of Senator Mason. I received an inquiry from Dr. McMurtry by telephone at my home in Ann Arbor, inquiring if I could respond to that request of Senator Mason's and go to Chicago, and I replied that I would prefer to make a deposition at Ann Arbor which Senator Mason would send to me, upon any points before the Commission, which I would very gladly do. Dr. McMurtry replied that he would prefer—Senator Mason would much prefer that I should go to Chicago, and I said I could not afford to leave my duties without ordinary compensation per diem, and expenses, which would be all that I would require.

Q. You do not know who suggested your name to Senator Mason? A. I do not.

Q. But I understand that you have made no experiments, conducted no experimental work yourself on bread that was baked with alum baking powder? A. I have not.

Q. You, yourself, have not demonstrated by actual experiments whether bread cooked with a proper baking powder, alum baking powder, and by proper, I mean one mixed in such proportion that the elements would neutralize each other, would present in the bread free alum or basic salts of alum or aluminum? A. I haven't made myself any experiments of the effect of eating bread made with alum. That I stated in my direct examination.

Q. I do not want anything but an answer to my question, whether or not you have made it, and want it as short as I can.

Mr. Cunningham: I, once for all, desire to say, that if the witness does categorically answer a question put to him by counsel, and if he wishes to qualify or circumscribe in any way, it is proper for him, having done that thing, having answered the question, to put at that place just such qualifications, conditions or circumstances as to the witness seems right. I do not think counsel ought to interrupt the

Doctor when he is proceeding immediately, having answered the question, to qualify. I don't think it is just right.

Mr. Seddon: I recognized the full right if a direct answer needs explanation, to qualify it, but I do not want the witness to go off on another subject by that answer and to explain the general features of the case.

Mr. Cunningham: I agree to that. The Doctor has something to say.

The stenographer reads the last question and the answer of the witness.

The Witness: I have nothing further to say.

By Mr. Seddon: You spoke of the fact that the majority of scientific opinion was opposed to the use of alum in the preparation of baking powder, and as I understood you to say, your opinion was that the majority that were opposed to it. Did I get your statement correctly? A. I am not sure. I doubt if I stated just that. I think I said that in my judgment the weight of sanitary and scientific opinion was against the use of alum baking powder.

Q. Well, what do you say on that subject now? A. I am inclined to say the same.

Q. Do you base it upon the number, or upon the value of the opinions that have been expressed? A. It is pretty difficult for me, sir, to explicitly specify all the sources of my judgment, all the sources of information upon which I base a conclusion. It is from general reading more largely than from any other source, general reading of professional and scientific publications, but it is not exclusively from that.

Q. Well, you said, you very early in the history of the baking powder business, formed this conclusion that you have with reference to the wholesomeness or unwholesomeness of bread prepared with alum baking powder, did you not? A. I did, but I said that the question which first arose was upon the use of alum alone in bread making, if indeed it may have been called a question at all at that time. It was hardly a question raised at that time. I shared the

common belief of chemists and sanitarians that alum should not be added to bread. When the question arose, the information arose, that alum was used as a constituent of baking powders, I shared the belief general at that time that it was almost, or quite without question a contraband article of food.

Q. Now in estimating the weight of the authorities, have you given to the weight any consideration of your own name as an authority? A. Oh, no sir.

Q. The weight you think outside of yourself? A. Yes, sir.

Q. Now, speaking of alum baking powders as distinguished from the mixture of alum in flour for the purpose of whitening bread, I believe it is used for that, you will admit that there is quite a respectable array of authorities that believe that bread cooked with these powders, properly prepared, is a wholesome diet, will you not? A. Yes, sir; of late years there are a number of very respectable chemists and professional men who have given adhesion, or consent, to the admission of baking powders, many of them, however, declaring that if alum be used in baking powder it should always be announced upon the label, while they do not so declare regarding other baking powders in use.

Q. While I should think that would be quite a good argument to make to the Court on this subject perhaps, but you will be very kind if you will limit your answers to my question. Now, Professor Mallet spoke of an authority here, quoted an authority, I suppose it was a respectable authority; Wynter Blythe, is a respectable authority, is he not? A. Entirely so.

Q. He is considered quite an eminent man on toxic substances and foods, is he not? A. He has published a great deal on foods and poisons.

Q. Is he not generally recognized by the profession as some authority? A. He is an authority of fair measure of standing.

Q. Now, when he makes a statement that I read yesterday, to the effect that bread cooked with alum baking powder properly prepared, pastry, bread or cakes, in his opinion, have not the slightest appreciable influence on health, and especially when he says the writer's family had

used it off and on, alum baking powder, for years, without injury, I suppose that would be entitled to some scientific weight, would it not?

Mr. Cunningham: I object; if the counsel is going to contradict the witness with a book, I submit that it is fair to let the witness see what the writer has said.

Mr. Seddon: I have no objection to his seeing it. I want his opinion on the weight of authority. There it is (handing book to witness.)

Mr. Cunningham: I think the witness is entitled to read the context for himself.

Mr. Seddon: I have no objection.

Mr. Cunningham (to the witness): Now you can proceed.

The Witness: I know, and have known in a general way, the opinion of Wynter Blythe on this subject and I have counted him as one of the dissenters from the weight of average opinion of which I have spoken. In this paragraph which you now show me, he leaves it an open question rather than one which he decides himself. "On the other hand it is a question whether in moderate doses in which alum is taken in pastry or bread or cakes, the flour of which has been mixed with alum baking powder, it has the slightest appreciable influence on health;" and before that sentence is this: "It has also been satisfactorily established by Siem that if animals are treated by subcutaneous doses of alum salts a peculiar nervous condition may be produced, similar to the disease known as bulbar paralysis." I do not use my own judgment regarding the use of alum without any entrance of alum into the general circulation of the blood.

Q. We do not wish to contradict the statement that if you introduce alum into the circulation of the blood it has an effect. What do you know of Professor Patrick, professor of chemistry in the University of Kansas? A. I do not know anything of him that I remember at the present time.

Q. Do you know of him? A. I am not sure that I do, sir.

Q. Did you ever hear of the experiments that Professor Patrick had made upon cats, feeding cast with bread, or biscuit, cooked with alum baking powder? A. Not that I remember now.

Q. Your attention has never been called to it? A. I think not.

Q. To refresh your memory—

Mr. Cunningham: The witness says he never heard of it; how refresh his memory?

Mr. Seddon: I think so important an element in controversy as this—

The Court: Proceed and put the question.

By Mr. Seddon: In detailing the experiments that he made to a considerable extent—

Mr. Cunningham: I must ask something. If the witness is going to be questioned concerning a paper writing, it is reasonable and fair that the writing should be submitted to him, and not have it edited by the counsel, however fair the counsel will be.

The Court: It may be read to the witness.

Mr. Seddon reads the article referred to as follows:

ALUM IN BAKING POWDERS.

"To the Editor of the Scientific American:

"Although the discussion upon the use of alum in baking powder has somewhat subsided of late, I beg the use of your columns for a word more on the subject.

"In a circular that was scattered broadcast throughout the West, giving the opinion of several men of science, I find one, purporting to be from a very prominent physician of New York City, in which are the following words (preceded by a statement of the difficulties in the way of effect-

ing a thorough mixture of the ingredients, bicarbonate of soda and alum):

"'But even if the exact proportions were maintained, the salts formed would retain their injurious properties, as they would dissolve in the gastric juice. The gastric juice contains not only lactic acid, but a large amount of hydrochloric acid, and both the sulphate and hydrate of aluminum would be dissolved.'

"Now I must do the learned physician the justice to say that I do not believe he ever made exactly this statement; for, as has been once or twice explained in this paper, if an alum powder be properly mixed (which was assumed in the quotation), no sulphate of alumina can possibly be present after baking.

"The idea that the hydrate of alumina might be dissolved in the gastric juice was a new one to me, and led to an experimental research which it is the object of this paper to detail.

"First let me quote from the books a few words concerning the 'large amount of hydrochloric acid' in the gastric juice.

"In Watts' Dictionary of Chemistry, Vol. II, page 822 (published 1872), I find the following:

"'Respecting the nature of the free acid in gastric juice, the opinions of different observers are greatly at variance. Prout and Braconnot concluded from their own experiments that the gastric juice contains free hydrochloric acid. Lehmann, on the other hand, found free lactic acid in this secretion, and attributed the free hydrochloric acid given off on evaporation gastric juice in vacuo to the decomposition of chloride of calcium by the lactic acid.'

"'Bernard and Barreswil altogether deny the existence of free hydrochloric acid in the gastric juice,' and their reasons therefor are given at length.

"Von Grunewaldt likewise maintains that human gastric juice contains no free hydrochloric acid, the acid reaction which it exhibits being due to organic acids, chiefly lactic and butyric.

"Two other authorities, Bidder and Schmidt, support the idea of free hydrochloric acid in minute quantities.

"One of the latest opinions, and probably the correct

one, regarding the state of the hydrochloric acid in the gastric juice, is that it is not exactly 'free,' in the proper sense of the term, but is combined with the pepsin of the juice, forming a sort of 'conjugated acid' called pepto-hydrochloric acid. That some such combination exists is almost proven beyond doubt by the facts cited (Watts' Dic. of Chem., 2d supplement, page 551, published 1875).

"From these quotations it is seen that the 'large amount of hydrochloric acid' in gastric juice turns out to be a very minute amount, and that probably not a particle of it is free.

"But however that may be, the practical question is, Will the hydrate of alumina, as it exists in bread after baking, be dissolved in the fluids of the alimentary canal? This question is important, for, if dissolved, it might produce in some slight degree the effects ascribed to alum; but if it is not dissolved, such effects are impossible, and alum, used properly as an ingredient of baking powder, may be considered harmless. But with the diversity of opinion that is seen to exist regarding the acid of the gastric juice, a priori reasoning is of little value; direct experiment can alone be trusted for a reliable answer.

"With the view of settling the question beyond dispute, I have, during the last two months, carried on a series of experiments upon living animals. The results obtained, so far as the kind of animal and the kind of powder employed are concerned, are, I think, conclusive.

"I ought to say that before commencing this research I had no opinions as to the probable results, and was equally prepared for an affirmative or a negative answer.

"The experiments were made with healthy cast, and with a well-known alum powder. (To avoid the appearance of advertising, I withhold the name.) They were conducted in the following manner:

"Biscuits were made with three teaspoonfuls of the powder to one-half a pint of flour; that mixture giving a relative proportion of powder about six times that usually employed, and twelve times that directed on the labels.

"A different sample of powder, (i. e., from a different can or package) was employed for each experiment, to give as broad a range as possible.

"Half a dozen biscuits were baked in each batch. Of these, from one to one and a half were fed to a cat that had

fasted one or two days; this gave at least half a teaspoonful of powder for the actual experiment.

"After digestion had gone on a certain length of time, varying with the different subjects, the cat was killed, and the entire contents, not only of the stomach, but of the small intestines also, were examined for dissolved alumina. This examination was conducted in the most careful manner possible; and the method was that employed for detecting the smallest amounts of alumina (i. e., digesting the mass in water, filtering, evaporating, and igniting to destroy organic matter; extracting with strong acids, filtering, and finally, adding ammonium hydrate).

"In every case a large amount of sodium sulphate was found (in solution, as was expected), and also a certain amount of hydrate of alumina, undissolved.

"The time allowed for digestion and the results obtained, as copied from my note-book, are as follows:

"Experiment No. 1.—Time of digestion, 25 minutes.
Found of dissolved alumina, ——— not a trace.

"Experiment No. 2.—Time of digestion, 45 minutes.
Found of dissolved alumina, ——— not a trace.

"Experiment No. 3.—Time of digestion, 1 1-2 hours.
Found of dissolved alumina, ——— not a trace.

"Experiment No. 4.—Time of digestion, 2 hours.
Found of dissolved alumina,——— not a trace.

"Experiment No. 5.—Time of digestion, 2 1-2 hours.
Found of dissolved alumina, ——— not a trace.

"Somewhat surprised at the uniformity of these results, and thinking that the organic matter of the food might possibly interfere with the solution of the alumina (or with any detection of it), I made two more experiments of a most crucial nature.

"In each two teaspoonfuls of the powder were mixed with water and asked at the ordinary temperature of the oven; the whole mass was then fed to a cat (under compulsion), allowed to digest for a certain time, after which the stomach and intestines were examined as above.

"The results from my note-book, are as follows:

"Experiment No. 6.—Time of digestion, 1 1-4 hours.
Found of dissolved alumina, ——— not a trace.

"Experiment No. 7.—Time of digestion, 1 3-4 hours.
Found of dissolved alumina, ——— not a trace.

"These experiments seem to establish beyond controversy the fact that hydrate of alumina, when baked, is not dissolved by the juices of the alimentary canal.

"I resolved next to determine whether or not the hydrate of alumina in the gelatinous form (unbaked) is soluble in the digestive fluids. Two experiments were made, in each of which two teaspoonfuls of the powder were mixed with water and simply boiled until chemical action ceased.

"Each mass being fed to a cat, and the examination conducted as before, the results were:

"Experiment No. 8.—Time of digestion, 1 hour.

Found of dissolved alumina, ——— a trace.

"Experiment No. 9.—Time of digestion, 2 hours.

Found of dissolved alumina, ——— a trace.

"These two experiments seem to show that the gelatinous hydrate of alumina (moist and unbaked) is dissolved to a very slight extent in the digestive fluids. Hence the public is advised not to eat bread in the dough; it should always be baked.

"Another idea concerning the making of bread with the use of alum powders suggested itself.

"The chemical action spoken of above, by which the alum is destroyed and hydrate of alumina and sulphate of soda are found, requires both the presence of water and heat.

"Now, if bread is carelessly mixed with an insufficient amount of water, parts of the flour (and with it the powder) remain nearly or quite dry; and, after baking, such bread would certain small amount of alum.

"In order to put this to the test, and also to furnish a check on the other experiments with biscuit, I had a batch made exactly like those of the earlier experiments, except that the mixing was done with less water and less thoroughly than usual.

"A biscuit of this batch being fed to each of two cats, the following results were obtained:

"Experiment No. 10.—Time of digestion, 1 1-4 hours.

Found of dissolved alumina, ——— a trace.

"Experiment No. 11.—Time of digestion, 1 1-2 hours.

Found of dissolved alumina, ——— a trace.

"These results were, of course, exactly what was expected; their main value lies in this, that they prove the entire reliability of the first five experiments.

"They also show that to insure the entire absence of alum in the bread, the mixing must be done with plenty of water; and to effect this I would suggest (although I do not consider it an absolute necessity) that the batter, with the powder added, be made rather thin at first, and then thickened by addition of more flour without powder.

"The conclusion to which all these experiments lead is obvious. Assuming that the human digestive fluids act in about the same way as do those of the feline race—and I believe that assumption has always been made—it seems to me established, as well by experiment as by reason, that a properly made alum baking powder, as used in making bread or biscuit, is perfectly harmless to the human system. And that some, at least, such properly made powders are manufactured and sold in quantity, seems also demonstrated.

"In closing, allow me to say, in order to prevent all suspicion, that this investigation was undertaken for the sole purpose of finding out the facts in this matter, one of so great importance to us all; that no party or parties interested in the sale or manufacture of baking powder had any knowledge of the investigation, and that I have received no remuneration for it, or for this article.

"Respectfully,
"G. E. PATRICK,
"Prof. of Chemistry in University of Kansas.
"University of Kansas,
"Department of Chemistry.
"Lawrence, Kansas, June 14th, 1879."

Q. Do you think that a man who exercised the care in making experiments such as detailed in that article read to you, is a man worthy of any consideration in estimating the weight of opinion?

Mr. Cunningham: I object to the question and ask before being required to speak to the article, that the witness be allowed to look at it, and to see and to know in the first place how far it is authentic; or, at all events, having stated he does not know anything about Mr. Patrick, who he is, or anything, that before being required to speak to the paper, he be allowed to look at it.

The Court: The witness may be permitted to look at it.

Mr. Seddon: I withdraw the question.

Mr. Cunningham: (To the stenographer) Strike out the whole thing from the beginning.

Mr. Seddon: If you want me to go on, I can go on and examine it to make it short—

The Court: Let the witness examine the paper.

Counsel for the state hands the witness the paper referred to .

The Witness: I know Professor Bailey, the head professor of chemistry in the University of Kansas, unless there has been some change.

By Mr. Cunningham:

Q. Is that Kansas or Kentucky? A. Kansas, Lawrence, Kansas.

The Court: This appears to have been written some twenty years past.

The Witness: 1879, I did not notice the date. I cannot recollect the gentleman who is the writer of this article, whose name is signed to it, dated in 1879. I have no knowledge of him, of his standing, favorable or unfavorable. I should not expect that experiments upon animals with bread made with alum, even with the increased quantity of alum which was mentioned here, would exercise upon those animals the effect of the alum with sufficient intensity to give results of any bearing, any real significance, upon the question.

Q. Have you ever ascertained, by actual experiment, whether hydrate of alumina is supposed to be in bread after the preparation and cooking of it alum baking powder, is dissolved by the gastric juice? I speak of actual experiments made? A. I have made experiments to the same effect;

I have not treated the hydroxide of alumina taken from bread itself for the purpose, but I frequently in my work in the laboratory treat hydroxide of aluminum, which has been sometime heated to 95 or 100 degrees Centigrade, heated on a water bath, and I observe that it is soluble in acids of concentration in greater than 2-10 of one per cent, which is the concentration of the acids of the stomach.

Q. I did not ask you what experiments you had made in that line, I asked you a simple question, whether you had made any actual experiments of the kind I had put to you. A. I think I answered the question, with the necessary qualification.

Q. Do you think that qualifies the statement that you have never made such experiments?

At the request of defendant's counsel the stenographer reads the question beginning with the words: "Have you ever ascertained by actual experiments."

The Witness: (To the stenographer) Will you read my answer?

The stenographer reads the answer referred to.

The Court: (To the stenographer.) What follows?

The stenographer reads the answer referred to.

The Witness: I do think it necessary to qualify the statement first made; I have not treated hydrate of aluminum taken from bread, but I have treated hydrate of aluminum, treated in substantially the same manner.

By Mr. Seddon:

Q. Then as I have understood, you have never taken bread and cooked it with alum baking powder and after having cooked it, made tests of what effect it would have upon the gastric juices in the stomach? A. I have not, as I said.

Q. Does hydrate of aluminum have any tendency to combine with any of the elements of flour in soluble compounds, or is that known? A. I apprehend it has a tendency

to unite adhesively with considerable force, and, in a way, possibly approaching chemical union with some of the proteids of bread, but I have not the exact knowledge upon the precise chemical nature or proportion of such compound.

Q. Don't you know, as a matter of scientific knowledge, that scientists, or many scientists, hold that hydrate of aluminum will form insoluble compounds with gluton, mucedine and gliadine? A. It is those proteids of wheat, generally spoken of together as gluten, which I had in mind in my last answer. I believe it possible, almost certain, that they tend strongly—that the aluminum hydroxide tends strongly to adhere to those proteids and, possibly, to enter into something like a chemical union, but I do not know, nor have I seen it stated precisely, what chemical union that may be. If I may add a word: I connect this in my own mind with the effect of alum compounds and gluton, the proteids of wheat, in such use of it as I have referred to several times in my testimony, I believe that aluminum hydroxide in its moist condition is capable of uniting and acting chemically.

Q. What? A. Of uniting and acting chemically, almost to the same extent that the solution of alum is capable of doing, though in a milder degree.

Q. Is it not a fact that text-books on chemistry state, as a general proposition, that metallic salts will form an insoluble compound with gluton, mucedine and gliadine? A. Some of them do, and those proteids are separated from each other by the different action of defferent metallic salts.

Q. Isn't it true of alum salts, as well as other salts—or do you know anyahing about that subject? A. Not anything further than I have stated.

Q. Have you made any direct, actual experiment to ascertain whether freshly precipitated hydrate of aluminum has exactly the same physiological effects on the human system as the aluminum compounds left in bread prepared with an alum powder? I now refer to your own experiments and you can answer that as you think proper, yes or no, and make such qualifications of your answer, hoping you will limit it to the qualification of your answer.

At the request of counsel for the state, the question is read to the witness.

The Witness: I have not.

Q. What would be the effect of injecting into the circulation of the human body, Rochelle's salts? A. I believe it would be substantially the same as the injection of sodium tartrate, sodium neutral tartrate.

Q. You have not made any experiments in that line? A. I have not.

Q. And you do not know actually from any other experiments that have been made, what direct effect it would have, do you, speaking of other experiments? A. I know, that with mammalian animals, it is declared that injection of sodium tartrate is without serious disturbance, within moderate proportions, but I have not any collected information on that subject.

Q. Rochelle's salt is an active purgative, is it not? A. A very mild purgative, I suppose.

Q. It is one of the ingredients of Seidlitz powders, is it not? A. I should object to the choice of the word "purgative;" I should prefer to say a mild laxative.

Q. I am not asking you about Sedlitz powders. We all know something about them.

Mr. Cunningham: Then you do not need the information.

Mr. Seddon: I want to call his attention to it.

Q. It is an active principle of Seidlitz powders? A. Well, perhaps, the chief active principle, one of them certainly.

Q. You know what Seidlitz powders are composed of, as a medical man? A. Yes, pretty nearly.

Q. You know that Rochelle's salt is an active principle of them, is it not? A. Yes, although the Seidlitz powder owes some of its power to the dissolved carbonic acid gas.

Q. Do you know how many grains there are in an ordinary dose of Rochelle's salts? A. I would not undertake to say now.

Q. You are a medical man, are you not, familiar with —you state that you are a professor of pharmacy? A. Yes, sir.

Q. A doctor of medicine? A. I presume I ought to know, but I cannot say at this moment what the dose of

ordinary range, or the limit of doses of Rochelle's salts is; I am not in the practice of medicine. If I were to report upon the proper dose of Rochelle's salt, to be introduced into the next revision of the pharmacopoeia, I should make a great many inquiries, quite an extensive investigation and consult a great many people. I do not care to put myself on record in this testimony, as to what is the dose of Rochelle's salts.

Q. You then, have not given very much attention to the cream of tartar powders, you say you have not given a great deal of attention to cream of tartar, otherwise you would probably know that in connection with that, wouldn't you? A. I have given some attention to cream of tartar powders, and I know of Rochelle's salt as a product of cream of tartar powders, and a mild laxative.

Q. Would you consider an habitual daily diet of Seidlitz powders, a very healthy one? A. Well, that depends upon what proportion of food the Seidlitz powder formed.

Q. I am speaking of it in food. I am speaking of it with meals, or taken before meals, every day. A. That depends upon what proportion or quality of it is used.

Q. What proportion of it would you consider would do harm, or would not do harm to children, for instance, taking it every meal? A. Well, such proportions of it as would be found in ordinary, moderate free eating of fruits would, I think, be generally unobjectionable, not always.

Q. I believe the cream of tartar in fruits is not Rochelle's salts. I am trying to get at the question of concentrated Rochelle's salts. A. Rochelle's salt is a neutral tartrate of potassium and sodium. Fruits contain tartrates, both neutral and acid tartrates, quite generally, and the substantial equivalent of sodium potassium tartrate is found in various fruits. The precise equivalent is not found in the grape, but the grape in connection with other fruits, together furnish in many cases, the full equivalent, that is, the neutral salt the alkali salt and tartaric acid.

J. W. MALLET, recalled for the State, testifies as follows:

Direct-Examination by Mr. Cunningham.

Q. Judge Seddon has read, at considerable length,

something from No. 185 of the Scientific American of date July 19th, 1879. I do not know whether my learned friend (Judge Seddon), read that loud enough for you to hear it, and I will, therefore, ask you to look at this article marked "Alum and Baking Powder," and when you have read it over, I will ask you if there is anything there which tends to change the opinion which you have expressed on this subject, and in that connection you may make any criticisms that you may think just, upon the methods, or determinations or ascertainments, appearing by that paper to have been made. I will also ask you to state what, if anything, you know about the identity or reputation of the person who purports by that article, to have made the experiments.

Mr. Seddon: Bringing the witness back here and putting him on the stand again, I have no objection to, but I think it ought to be confined to proper limits. Your Honor will remember, when we were examining Dr. Prescott as to the weight of authorities, and referred to certain people as authorities, and he was asked if he knew Dr. Patrick, whether he remember him, with a view of asking him whether he considered him an authority, and I proposed to read the last clause, merely of the article referred to, for the purpose of seeing whther I could not call his attention to the fact that he had heard it, assuming that an article of that kind in such a controversy as that could not escape a man who has been so well acquainted with the subject, and Mr. Cunningham insisted on having read the whole article. I never read it as evidence in the case and did not interrogate him about it at all. He said he did not know anything about Professor Patrick and we did not pursue the subject further. He made some voluntary criticisms which we did not object to, and do not object to now. I think it ought to be limited to what was brought out and that would be in the nature, it strikes me, of contradicting or disproving something we brought out collaterally in cross-examination. It is a well known rule that you cannot contradict or sustain a witness on a collateral matter brought out in cross-examination.

The Court: I have not regarded the article in question as being in evidence in the case, in any wise. I regard the question asked as an inquiry of the witness, whether he knew

of such an article by a reputed author, and what, if any, effect that article would have on his opinion. I am not sitting here to try the question of the thoroughness or authenticity of those experiments, or supposed experiments, and the answer of the witness will be confined solely to the inquiry, as to whether he is acquainted with that article and what, if any, effect it would have upon his own opinion, and also as to the standing of the person who is reputed to be its author.

Mr. Cunningham: That is the entire purport of the question I put.

The Court: I think the witness understands the question fully and also the ruling of the court. He may proceed, and if he transgresses the line I will prevent him.

The Witness: I believe I was asked, first, whether I was acquainted with the article. I am pretty sure I never saw the original article before. I have a vague recollection of having seen it quoted, or extracts from it, I cannot say where, or under what circumstances. I know absolutely nothing of Professor Patrick, beyond seeing his name to it, or seeing such reference as I said before; I never heard of him before and have no idea of his scientific standing. Two things lead me to attach very little weight to this, or would give very little tendency to modify my opinion. In the form in which the article appears—

Mr. Seddon: He is going into a discussion of the thing as if it were in evidence, and that would lead to cross-examination. I think the ruling is proper, that he can state whether it had any effect on his opinion and we will not cross-examine as to why.

The Court: I do not want to carry the case into a controversy as to the merits or demerits of this article. The question before the witness was, whther his judgment would be influenced by it or not.

Mr. Cunningham: Surely the witness, as an intelligent person, is entitled to explain the grounds of his statement in order, if need be, to distinguish it from a mere arbitrary or

capricious dictum. I apprehend that every person in stating his opinion or conclusion about any matter is entitled in justification of himself, to state the reason why that is his belief or opinion.

Mr. Seddon: That might be if we were crossexamining. It is a question of weight of authority and his opinion about the weight of authority.

The Witness: I was going to use but a few words more, namely, that the only ground I have for forming any conclusion as to the weight to be given, or not to be given to the article, is contained in the journal in which it appears, and the nature of the article itself. From both of these considerations my impression of it is unfavorable. It does not seem to me to appear in a journal of such high scientific standing as would be likely to include valuable work, and the other is the intrinsic evidence in the article, without going into detail, to lead me to attach but little weight to the conclusion.

By Mr. Cunningham:

Q. You might, if you please, not otherwise, specify what the things are that you say appear there would lead you to attach little importance to it?

Mr. Seddon: When we attach him he can support it, but not until then.

The Court: The discussion has gone far enough.

Q. I will ask you, Doctor Mallet, if the residue left in bread baked with alum baking powder serves any useful purpose in the economy of the animal system when it is consumed by human beings? A. I do not know of any useful purpose that it serves.

Q. Do you then consider alum baking powder healthful and wholesome when used in the preparation of foods?

Objected to on the ground that he has already answered that question directly several times.

Mr. Cunningham: Do you object to his answering it again?

Mr. Seddon: I cannot see the use of going over it again it is only consuming time.

The Court: Let him answer the question.

A. What was your question?

Q. Do you consider alum baking powder a healthful and wholesome thing when used in the preparation of food? A. If I understond that question rightly it is a distinct question from that put to me yesterday in this that I understand I was then asked as to whether there was any objection to the use of alum baking powder owing to the residuum that was left in the bread having a harmful effect and I now understand this question is whether any benefit is derived from its use in the preparation of food. Do I so understand the question?

Q. Yes, that is right. Do you consider alum baking powder a healthful and wholesome thing when used in the preparation of food? A. I would answer that by saying no I do not. I do not know of any benefit that it would be to the human system. On the contrary, I answered the other branch of that same inquiry yesterday by saying that I thought it was unwholesome and unhealthy when used in the preparation of food.

Q. Does the residuum left in the bread made with cream of tartar baking powder serve any useful purpose in the animal economy and if so what? A. If the quantity is not too large it will certainly have some beneficial effect in that it will aid digestion. It would have the effect that is commonly attributed to any of the vegetable acids or as we commonly call them the fruit acids.

Q. Is the residuum left in the bread baked with cream of tartar a healthful and wholesome constituent of the human food? A. You mean cream of tartar baking powder, not cream of tartar?

Q. Yes, I will repeat the question with that amendment: Is the residuum left in the bread made with cream of tartar baking powder a healthful and wholesome constituent of the human food? A. To the extent covered by my previous answer I will say yes that it is.

Q. Do you then consider cream of tartar baking powder a healthful and wholesome thing when used in the preparation of the human food? A. I should say, yes, sir; with

the qualification that the baking powder was not used in an extravagant excess—assuming of course that it was properly prepared.

Q. Assuming that the cream of tartar baking powder is properly prepared would you say that it is a wholesome and healthful constituent of the human food? A. Yes, sir; with the qualification that I would limit my answer to persons of average health—ordinary health. I would not like to take exceptional conditions.

DOCTOR VICTOR C. VAUGHN, a witness of lawful age being produced, sworn and examined on the part of the plaintiff, testified as follows:

Direct Examination.

By Mr. Cunningham:

Q. State your full name? A. Victor Clarence Vaughn.

Q. Where do you reside? A. I reside at Ann Arbor, Mich.

Q. What is your occupation? A. I am a practitioner of medicine and am the Professor of Chemistry and Professor of Hygiene, also Dean of the Medical Faculty of the University of Michigan.

Q. In what schools, colleges or institutions of learning were you educated? A. I graduated in the first place at Mount Pleasant College and afterwards graduated from the University of Michigan, taking three degrees. I also have an honorary degree from the University of Pennsylvania and have also studied in Berlin, Germany.

Q. What has been your work and experience in the line of your profession? A. I have been engaged for the last twenty-five years or thereabouts in matter of hygienic importance, especially devoting myself to the subject of foods. I was for fourteen years a member of the State Board of Health of the State of Michigan; I wrote the Lomb Prize Essay on the subject of healthy food for working people and I have lectured on that subject and still lecture on the subject. I have been engaged more or less in the chemical and physical examination of foods.

Mr. Seldon: Did you say fruits? A. I said foods—foods. I was the surgeon of Fifth Army Corps in Cuba in 1898, and learned something about the foods there. After my return to this country I was appointed one, of a Board of three, to inspect the camps in the United States and in that connection made special inquiry into the foods supplied to the soldiers and had something to do with the food.

Q. During the last twenty-five years has your work been of such a character as to bring you more or less in contact with the question of the adulteration of food? A. I have during the whole of this time, twenty-five years, devoted more or less time and in fact have most constantly been engaged in some work connected with the question of the adulteration of food.

Q. Has your attention ever been directed to the subject of the use of alum in the preparation of food? A. Yes, sir; I began that question many years ago when alum was first brought into use for the purpose of being mixed with inferior flour out of which bread was intended to be made. Since that time I have been constantly interested in the subject of alum in bread, both when added directly to the flour and when used as a baking powder. This is, I mean when used as a constituent of baking powder.

Q. Have you during the time you have just spoken of —that is during your work along this line kept yourself familiar with the scientific literature on the subject and the treatises published by the leading scientists on those subjects? A. I have tried to keep myself pretty well up and I think I have succeeded in doing so.

Q. What, if any, research, tests or experiments have you made to determine the consequences of the use of alum in the preparation of human food? A. I have made no direct experiments to demonstrate the harmful effects upon the animal organisms. I have examined baking powders but I have made no animal experiments—that is—I have made no experiments myself as to its effect on the animal organism but I am familiar with the experiments made by others and have kept myself posted on those questions.

Q. Have you reached any conclusion as to whether or not the use of alum is wholesome and harmless, either from any knowledge you have on the subject from investigations

you have made or from any knowledge you may have gained from scientific treatises on the effect that salts of aluminum have on the human system? A. I believe I have reached a conclusion on that subject, yes, sir.

Q. What is that conclusion? A. I believe that salts of aluminum are harmful in human food.

Q. I will ask you whether or not there is a uniform consensus of opinion among the medical men and men of science, that alum used in the preparation of food is wholesome and harmless? A. There is no such consensus of opinion among those engaged in that work of investigating this question of human foods.

Q. On which side of that question in your opinion is the weight of scientific authority? A. The weight of scientific authority is decidedly against the use of alum or any of the salts of aluminum in foods of any kind.

Q. Have you read the deposition of Doctor E. E. Smith and Doctor Austin Flint given in this case? A. Yes, sir; I have read them.

Q. What if any criticisms do you make upon the methods employed by Doctor Smith in his experiments and the conclusions which he reaches as a result of those experiments? A. I have several criticisms to make upon the experiments of Doctor Smith and the conclusions which he reaches in regard to them. I will have to refer to my notes on the subject as my answer will involve some question of figures. Now in the first place on page 9 of his testimony—

Mr. Seddon: You have there the printed copy I believe? A. Yes, sir.

Q. Just wait a moment and I will see if I can find my copy. I thought I had a printed copy and it would be easier to follow you if I had the printed copy. I find that I must have left it at the office.

Mr. Cunningham: I thought I had an extra copy here and I am sure you would be welcome to it but I find I have not.

Mr. Seddon: Just go on and answer the question Doctor and I will follow you as well as I can from the manuscript copy of the deposition. A. Referring then to page 9 of the

deposition where he refers to that question of artificial digestion, speaking of the Layton bread and the control bread in his direct examination, the criticism I have to make in regard to that experiment and the conclusions he draws as the result of the experiment is this: He stated as a conclusion from these experiments that 99 per cent nitrogenous matter in the Layton bread, or rather 99.2 per cent nitrogenous matter present in the Layton bread had passed into solution and that 99 per cent nitrogenous matter in the control bread was dissolved, showing that in one case, the case of the Layton bread, .8 of one per cent remained undissolved or undigested and in the other case one per cent of the nitrogeous matter remained undissolved or undigested. Now he concludes that those breads were digested. I say he concludes that they were digested but he offers no proof as a matter of fact that they were digested.

Q. You say he merely draws that conclusion without offering any proof that they were as a matter of fact digested? A. Yes, sir. He simply says that the proteid materials passed into solution. There is no proof that peptone which is practically complete digestion was formed in either bread, or whether if formed in either bread it was formed in the same amount in both. His experiments simply show that the nitrogenous matter was dissolved and it does not show there was complete digestion in either case. Of course the action of the hydrochloric acid would dissolve the proteoid material in the bread. It may have been that in one bread the proteoid material was converted into soluble albumenoids and the other may have been converted into peptonoids. It does not show the presence in either case of the slightest amount of peptone. Now on page 12 of his deposition in the experiment upon one of his live subjects he fed the subject sixty grammes of bread and gave him three hundred and fifty centimeters of water. Now then in the case of the Layton bread after a certain length of time the contents of the stomach were drawn off and he determined the per cent of total hydrochloric acid and free hydrochloric acid in the contents of the stomach. He does not determine at all the amount of hydrochloric acid, nor the per cent of hydrochloric acid. He does not show the amount of gastric juice present, nor is there any evidence that he made any test to see whether the free hydrochloric acid was hydrochloric acid or not.

Mr. Seddon: What is that? A. I say he made no test for the purpose of ascertaining whether the free hydrochloric acid was hydrochloric acid, I mean whether the free acid was hydrochloric acid. I inadvertantly used the name in there twice. There is no evidence that he made any effort to ascertain anything about the lactic acid present. He made no such experiments and if he did he does not mention them in his testimony. He simply determined the presence of the free acid and apparently assumed that the free acid was hydrochloric acid altogether, and in determining the per cent of free acid he finds .072 per cent for the Layton bread and .086 per cent in the control bread. The difference is very small and what difference there is is in favor of the control bread. I do not attach any importance to that difference as it is too slight to be of any importance either way. There was no test in any of these experiments for the purpose of ascertaining whether peptone was formed or not. The man to whom this material was fed had gone without his breakfast. He was fed an unusual ration of bread and it is very likely that the gastric juice itself would dissolve the nitrogenous matter in the bread under those circumstances.

Whether converted into peptone or not he does not say. It may have been converted into peptone in the case of one bread and not in the case of the other. His testimony therefore on that point as far as the digestibility of the two breads is concerned is practically worthless. He simply says in effect that the nitrogenous matter in the two breads was dissolved—that is all.

There is another general criticism which affects all of his experiments both those made with the artificial juice and the experiments upon a live subject as the experiments were too few in number. No scientific man is justified in drawing a general conclusion from such limited data as he had as the result of these experiments.

Now the next criticism which I make I attach considerable importance to and that is with reference to feeding himself for three consecutive days first upon one kind of bread and then upon the other. This experiment is detailed on page 15 of the printed copy of his deposition. In fact his description of it commences somewhat before that. He tells us on page 16 how much nitrogenous matter he took during

the three days and how much fat he took and how much carbo-hydrates he took. He gives protein 6.81 per cent, fat .24 per cent, carbohydrate 41.30 per cent. My calculation is that he took during the three days 780.9 grammes of carbohydrate. Now, a healthy man needs 18 ounces of carbohydrates every twenty-four hours which would be 540 grammes of carbohydrates every twenty-four hours. Doctor Smith had 780 grammes of carbohydrates in three days. He did not have enough of the carbohydrates necessary for a healthy man for two days, much less would it be enough for a healthy man for three days. He did not weigh himself. Had he weighed himself he would undoubtedly have found that he had lost in weight. In fact there can be no doubt about that because he lost more than he took in and therefore there must have been a loss of weight according to his own figures. I find that during those three days he took in 288 and a fraction grammes of protein material. He says 9.1 per cent of this was eliminated in faeces. Now according to this he absorbed 269 and a fraction grammes of proteoids in three days. Now he found in the urine 47.18 nitrogenous matter which is equivalent to 294 and a fraction grammes proteoids. If there was 269 grammes of proteoid material taken into the system and he eliminated from his body 294 grammes of nitrogenous matter he eliminated during that time more than he took in and the excess must have come from the breaking down of his own tissues for it is a well known fact that he could not eliminate more than he took in unless it came from some other source, like in this case the breaking down of his own tissues. That being the case he certainly lost in weight during that time. In order to have made that experiment and made it properly he should have ascertained whether nitrogenous equilibrium was maintained and if it was not maintained and the amount of nitrogenous matter eliminated was more than the amount taken in it is evident, as I stated before that the excess came from the breaking down of his own tissues and therefore the experiment is valueless in this that the subject was not in the condition of perfect health. He certainly could not have been in the condition of perfect health because he certainly lost in weight during that time and therefore as I have stated his experiment were rendered valueless.

Q. As I understand your explanation the amount of nitrogenous matter eliminated was in excess of the amount taken in and therefore the nitrogenous equilibrium was not maintained as it should have been if the subject was in a state of perfect health? A. Yes, sir; because the excess must have come from the breaking down of his own tissues.

Q. So that the excess came from the tissues of his own body? A. Another thing the amount of carbohydrates was too small. The amount of proteoids was too small. It was not so much so in the case of the proteoids as in the case of the carbohydrates. This criticism is of considerable importance in view of the fact that it shows clearly that Doctor Smith was not in a condition of nitrogenous equilibrium and therefore was not in perfect health which leads me to say that no conclusion can be drawn from the experiments made upon a subject whose condition is not that of perfect health. On page 21 of the printed record a mistake is very evident. It may be an error in the transcribing of the deposition where he speaks of the alum bread as compared with the other bread undergoing a putrifactive process in the intestines or intestinal tract he speaks of indol as one of the products of intestinal putrifaction and says that indol is a gas. Indol is not a gas. Indol is a solid substance. It is true that it is or has a very unpleasant odor but that does not indicate that it is a gas by any means. Assafoetida is not a gas by any means but it certainly has a very bad odor. Because indol has a very putrid odor it does not indicate that it is a gas. Indol is a solid substance.

Another very important criticism on the work of Dr. Smith is that he did not make any effort to determine the amount of aluinum either in the urine or feces. He did not find out whether any of the aluminum was absorbed and passed out through the kidneys or was eliminated through the faeces. This was a very important matter and certainly he should have made an effort to determine that question. It was certainly of very great importance in order to determine whether it was injurious or not to find out how the salts left the body. This he has not done. It is a very grave oversight and affects the value of the experiments to a very high degree. On page 33 I think it is, Dr. Smith says himself in answer to a question as to whether salts of aluminum may be absorbed and carried through the circulation and finally

eliminated by the kidneys without doing any harm that he did not think it would have any especial effect but that it would be readily eliminated by the kidneys. Pharmacological works all bear out the statement that if salts of aluminum are taken in any quantities into the circulation they will certainly do a great deal of injury to the kidneys and to the nervous system. On pages 35 and 36 he again shows that he is not familiar with the pharmacological experiments inasmuch as he says, referring to the poisonous effects of aluminum that it has never been understood and it is impossible to state what effect you are going to get. The true facts have not there been stated and it shows that he is not acquainted with all the information that can be gained on that subject. On page 36 his test there for the salts of aluminum by attempting to precipitate it by the addition of a solution of ammonia is entirely in adequate in view of the organic matter that would be present. In other words, the salts of aluminum would not all be precipitated in the presence of the amount of organic matter he had there, by the solution of ammonia.

Mr. Seddon: What is that? A. The salts of aluminum would not be precipitated by the ammonia in the presence of organic substances as was the case here. On page 45 he says that alum is not classed in the text books as a poison. As a matter of fact there are a number of standard works in which alum is classified as a poison which works have already been mentioned in the testimony in this case. In addition I want to refer to a very valuable and excellent work by Kobert on Toxicology in which alum is certainly classed among the poisons. On page 48 he says that the proteoids render the aluminum insoluble in that they form insoluble compounds, or he says that the aluminum enters into combination with the protein matter of the flour. As a matter of fact the gluten is dissolved in the stomach and converted into peptone and the peptones of all of these materials are more or less soluble, or rather are more readily soluble.

These are some of the most important criticisms that I wish to make. There are others that I might make upon the testimony of Doctor Smith as there are a great many little matters of detail about which I think he is mistaken but I do not wish to be hypercritical and would rather let

them go. The criticisms already given are the most important and I recognize that when a witness is giving testimony his statements may not be as full upon any particular point as he would make them if he had more time to consider these questions as they are but to him.

Q. I will ask you whether or not it is true that a substance may be poisonous and still not affect the process of digestion in the stomach? A. Certainly there are many substances that are poisonous which would not have the effect one way or the other.

Q. That is to say a substance may be poisonous and still not affect the process of digestion? A. Yes, sir. In some cases substances may be poisonous but if administered in small doses might aid digestion.

Q. Would the administration of one twentieth of a grain of arsenic three times a day for a few days retard digestion? A. No, sir; it would not. On the contrary it is frequently administered for the purpose of improving the digestion. It has in many cases that effect. I have myself administered it to patients and afterwards on washing out the stomach I find that it has aided digestion and certainly under certain circumstances when properly administered it is an aid to digestion.

Q. Yet at the same time a prolonged administration of arsenic would have an injurious effect would it not? A. Certainly it would.

Q. Do I understand then that the administration of one twentieth of a grain of arsenic three times a day daily for weeks, months and years would have any injurious effects upon the system? A. Certainly no such conclusion as that can be drawn from the fact that if administered in small doses for a short time it has a beneficial effect.

Q. That is to say then if it is administered in small doses three times a day for several days that is no indication that it may be administered in like doses day in and day out year after year? A. No, as I have already state you could not draw any such inference from the results of an experiment based on administering it daily in the quantity you mention for a short time.

Q. Would one thirtieth of a grain of strychnine administered three times a day for a few days retard the pro-

cess of digestion? A. Certainly it would not. It is very much like arsenic in that respect in that it is often given for the purpose of aiding digestion as it increases the amount of gastric juice that is poured out.

Q. You say that it would increase the flow of the gastric juice? A. Yes, sir.

Q. Now then I will ask you does it in your opinion follow from your last answer that the administration of one thirtieth of a grain of strychnine three times a day every day for weeks, months and years, would not result in any injury to the health? A. No, sir; that conclusion does not follow from my answer to your other question.

Q. Would the admintration of two grains of sugar of lead, in bread, three times a day for a few days, retard digestion? A. It probably would not.

Q. Does it follow therefore that a person could take two grains of sugar of lead three times a day for days, weeks, months and years without any harmful effects? A. Certainly no such conclusion as that can be drawn.

Q. Might a substance be administered three times a day for a few days which would aid digestion and yet it would injure the digestion when given three times a day for days, weeks, months and years? A. It certainly might.

Q. By that Doctor you mean for instance that dilute hydrochloric acid could be administered for a few days during which time would aid digestion but if administered daily for weeks, months and years it would injure digestion? A. Dilute hydrochloric acid may be administered under the circumstances suggested in the first part of your question for a few days as an aid to digestion but if continued running over a period of weeks, months and years it certainly would ruin the digestion.

Q. Admitting Doctor Smith's experiment to have been as he has stated, and with the results obtained by him, can you in your opinion conclude that, eating three times a day for days, weeks, months and years, of bread cooked with alum baking powder will not injure the health of the person so using it? A. We are certainly not justified in drawing any such conclusions from the experiments conducted by Doctor Smith. Conducted as they were covering a short period of time he is not in my opinion justified in concluding

that therefore the eating of bread made with alum baking powder day after day for weeks, months and years would not derange the digestion.

Q. You say he is not justified in reaching such a conclusion? A. No, sir; he certainly is not.

Q. What in your opinion are the poisonous effects of the salts of aluminum? A. Salts of aluminum when absorbed into the circulation have a decided effect. They cause in a general way what may be said—what is known as bulbar paralysis. The anterior horns of the spinal cord finally begin to degenerate and change manifests itself both motor and sensory. That is to say the patient would lose both sensation and motion. This gradually extends as the degeneration goes on and finally the whole of the spinal cord is involved and lastly the brain.

Q. What is the result? A. Why death is finally the result.

Q. As I understand it that in a general way is the effect when the salts of aluminum enters directly into the circulation? A. Yes, sir.

Q. Do the soluble salts of aluminum—all the soluble salts of aluminum the effects you have just describe? A. So far as we know all of the soluble salts of aluminum have the same effect. Experiments have been made with the lactate of aluminum and the tartrate of aluminum besides the sulphate, or rather the double sulphate of aluminum and sodium—alum.

Q. What is the effect if there is any upon the central nervous system? A. You mean of salts of aluminum.

Q. Yes. A. In addition to the statement I have already made I would say that the salts of aluminum effect both the spinal cord and the brain extending down into the lumbar regions. This degeneration as I have described before goes on and when the administration is long continued it is progressive of course and finally results in a complete degeneration of the spinal cord and coma would be the result followed by death.

Q. What effect do the salts of aluminum have upon the kidneys? A. The salts of aluminum like the salts of other metals such as zinc and copper produce what is known as

metallic kidney. This consists of degeneration of the kidney and it becomes less and less able to perform its functions and finally being unable to eliminate the poisonous matter it leads to death.

Q. What is the action on the kidneys of the other salts of aluminum? A. All of the salts of aluminum as far as we know have the same effect.

Q. What is the effect of the salts of aluminum on the heart when administered over a long period of time? A. It causes a fatty degeneration of the muscles. The muscles become stridated and the stridations become less and less distinct and the action of the heart is weakened thereby rendering it incapable of performing its proper functions and it may hasten death.

Q. What then is the effect, or rather I will ask you if this effect would follow the administration of salts of aluminum for a few days? A. No, sir; those effects would not follow if salts of aluminum were administered only for a few days unless the salts should be given in extremely large doses.

Q. Would the administration of salts of aluminum for a few days cause any of the disorders of the spinal cord or the kidneys that you have described? A. My answer would be the same as in regard to the effects on the heart. These effects would not be the result of a few days of administration of the salts of aluminum unless the salts should be given in very large quantities. I understood your question before to refer to salts of aluminum administered over a long period of time.

Q. I did ask you that question and I understood your answers were on that basis. My last questions referred to the effect of the administration of salts of aluminum for only a few days? A. No such effects follow in any of the cases I mentioned unless the salts of aluminum were administered in very large doses.

Q. Please explain Doctor the difference between the effects that would follow the administration of a dose of the salts of aluminum, say for a few days, even in quite large doses and where small doses were given continuously covered a long period of time, three times a day? A. Very large doses would cause acute congestion of the organs to which I have referred. Not necessarily would it effect the spinal cord

to any very great extent but it would produce a disordered condition of the kidneys while on the other hand small doses admintered three times a day covering a long period of time instead of producing a congestion slowly and gradually produce a degeneration. I will state it would take weeks and months to develope the symptoms sufficiently to be recognized.

Q. You are speaking now of doses introduced directly into the circulation? A. Yes, sir.

Q. What do you say to the proposition or statement of Doctor Smith in his deposition that alum and its constituents are found in almost all drinking water? A. I thing his statements are a little too radical I have examined a great many hundred samples of drinking water and I will say that in many cases there is none so to speak. Sometimes I have found a trace but in all cases of potable water the amount is so small that it is not considered. Aluminum and iron may be found in the water and it is not very easy sometimes for the chemist to say which is the aluminum and which is the iron and it is barely possible in some cases what might be taken for aluminum is really iron. As a matter of fact though the quantity of aluminum is so infinitely small that it could not be considered at all. The most that is ever reported—or rather the most that has been reported by competent authorities is a fraction of a part per million.

Q. You say the most reported by competent authorities is a fraction of a part per million? A. Yes, sir. I do not know of any analysis by any competent persons in which the amount is larger than one part per million.

Q. Do you know of any analyses that have been made of drinking water in which reports were made as to the amount of aluminum present? A. A few years ago twenty-six samples of drinking water were examined in Berlin. Many of them did not contain any aluminum that could be detected. That is to say if present at all it could not be detected and in a few which contained it the amount was a very small unit. A fraction of a gramme per liter. Possibly larger amounts may have been recorded but the results with which I am acquainted in no instances show more than one part per million which would be a fraction of a grain per gallon.

Q. Are you speaking now of alum? A. I am speaking now of aluminum compounds. I may say that alum is practically never found in potable water. There are some so-called alum springs in Virginia and southwest Missouri that are said to contained alum but those are exceptional cases and the alum probably gets into the water in the form of sulphate of sodium and sulphate of aluminum, that is to say, alum when dissolved in water, may not be present as free alum but in the form of a sulphate of aluminum and a sulphate of sodium and the result would be the same.

Q. Now speaking about those alum springs, is the water from those springs considered potable water? A. No, sir; they are what you might call acid waters.

Q. Well now about how much aluminum would a person get in drinking a gallon of good potable water? A. Well the largest amount as I stated would be about one milligramme per million—one milligramme per million liters which would be about four milligramme per gallon. Now sixty-six milligrammes make a grain so that would be about the largest possible amount he could get in a gallon of water, being a small fraction of a grain.

Q. That is the most he could get in drinking a gallon of water? A. Yes, sir.

Q. What do you say the effect would be upon the ordinary health of the body? A. Well, the amount is so infinitely small, being only a small fraction of a grain per gallon of water that it could not be considered at all.

Q. What do you say is a fair amount of bread which a man in ordinary health will eat in a day? A. That would depend to a great extent upon the other food material containing carbohydrates. It is estimated that a man in ordinary health requires about eighteen ounces of carbohydrates in a day and I think it would be about a fair amount if a man in ordinary health consumed about twenty ounces of bread, from that to two pounds.

Q. In the twenty-four hours? A. Yes, sir.

Q. What is the bread ration in the Army? A. It differs very materially under different circumstances, that is to say, when some equivalent is served the bread ration is smaller. It is estimated I believe in fact I know it is estimated that the ration should be at least twenty ounces or its equivalent.

Q. You say the amount will vary according to the other food that is supplied? A. Yes, sir; a smaller amount will be provided when other food is supplied which is the equivalent in furnishing carbohydrates.

Q. Could you give us the amount of bread served in the different armies as a ration? A. Well, the largest amount of bread that I know of is served in the Russian army which provides forty-three ounces. The British and the French run about twenty-eight to thirty-six ounces, say about two pounds.

Q. Suppose a man lived on bread, how much would he have to eat? A. Well, if he lived on bread as a matter of course he would not get any carbohydrate from any other source and, as I stated, he needs about eighteen ounces of carbohydrates in the twenty-four hours. Now bread we will say contains about sixty per cent. of carbohydrates. Now you would have to eat a sufficient amount of bread, in order to furnish the eighteen ounces of carbohydrates which would be—let me see—say thirty-two ounces, now take sixty per cent. of that gives you 19.2 ounces of carbohydrates, so that if he derived his carbohydrates from no other source it would be necessary to eat two pounds of bread per day to produce the normal quantity necessary to sustain the body.

Q. You think then he would, under those circumstances, be obliged to eat about two pounds of bread in the twenty-four hours? A. Yes, sir.

Q. And as we ordinarily consume our food in three meals he would consume about ten and two-thirds ounces a meal? A. Yes, sir; providing he divided it into equal portions.

Q. But at any rate he would have to consume that quantity of bread to afford the eighteen ounces of carbohydrates necessary in the economy of the body? A. Yes, sir.

Q. Now speaking of alum or aluminum that may come from pure water, that is, not a mineral water, but an ordinary pure drinking water, what relation would the amount a man would get from drinking a gallon of water bear to the amount he would get from eating two pounds of bread if the bread was prepared with alum baking powder? A. It would be almost impossible to give the proportion. The

amount that he would get from eating two pounds of bread would be so large when compared with the fraction of a grain that he would get from drinking a gallon of water that it would be almost impossible to give you any definite idea of the relative amounts. I probably can make you a little calculation that will give you some idea, but the variation is so wide that it is pretty hard to make any comparison. It has been stated here I believe that when bread is made with alum baking powder comprises about two per cent of the weight of the bread. Now then, if we take two per cent. of thirty-two ounces or two one hundredths of thirty-two ounces we get sixty-four one hundredths of an ounce. That would be the amount of baking powder that would be used in making the two pounds or thirty-two ounces of bread. Now then it is estimated that one-fifth of the baking powder is alum so we would have one-fifth of sixty-four one hundredths of an ounce which in round numbers would give us thirteen one hundredths of an ounce of alum in the two pounds of bread. That reduced to grains would give you about sixty-two and four tenths grains. I have made those calculations mentally, but I think you will find they are about right.

Q. Now then as I understand your calculation you have about sixty-two and four-tenths grains of alum or its equivalent in two pounds of bread? A. Yes, sir; now continuing my calculation the aluminum hydrate is about one-third of the amount of alum originally put into the bread so that you would have about one-third of sixty-two and four-tenths grains which would be about twenty-one grains in round numbers in the two pounds of bread.

Q. Twenty-one grains of alumina hydrate in two pounds of bread? A. Yes, sir; that would be a reasonable estimate.

Q. Doctor, I will ask you if you paid any attention to the conclusions which Doctor Flint drew from the experiments of Doctor Smith, and if you answer yes I will ask you whether in your opinion Doctor Flint was justified in his conclusions based upon the experiments of Doctor Smith and the results which Doctor Smith obtained? A. I have read the testimony of Doctor Flint very carefully and from what I have already stated concerning the testimony of Doctor Smith I certainly feel that Doctor Flint was not justified in

drawing the conclusions which he has drawn from Doctor Smith's testimony.

Q. What is the taste of alum when taken into the mouth? A. Alum, when taken into the mouth, has an astringent action and it puckers up the mouth, giving the same impression that one would receive on taking any astringent. The taste is somewhat bitter and at the same time a little sweetish. It might be summed up by saying it is astringent.

Q. Have you either from personal observation or from the works of standard authorities on the subject learned what is the effect upon the animal system when alum is taken into the human stomach? A. A small amount of alum if introduced into the human stomach has an astringent action and leads to constipation especially by its action on the intestines. A large amount of alum acts as an emetic, its action causing vomiting. If for any reason it does not cause vomiting and is present in large quantities in the stomach vertigo or dizziness will follow which will be more or less marked even up to complete coma. Death may result or there may be a very slight vertigo. The result of course would depend upon the amount taken, that is to say, a smaller amount may produce only a very slight vertigo or there may be sufficient to produce complete coma and death.

Q. I will get you to state whether or not there is a general and popular prejudice against food containing alum? A. I think there is such a prejudice, yes sir.

Q. You think there is such a prejudice? A. Yes, sir; that is my opinion, but it is only an opinion drawn from personal talk with other people and what I have learned generally of the matter.

Q. Have you seen many specimen packages of baking powder sold in the market? A. Yes, I have seen very many specimen packages. I have procured or endeavored to procure a sample of all the different brands of baking powder that are sold in the state of Michigan and I think I have pretty nearly succeeded.

Q. I will ask you if any of them are marked so as to indicate that they contain alum? A. I never saw any so marked.

Q. If in the alum baking powder there is an excess of alum over and above the amount necessary for a complete

decomposition of the sodium bicarbonate will the alum in your opinion be found in the residue after the reaction? A. Well, I certainly think it will, because when alum was first used in bread, not in baking powder understand me, but when it was first used in bread, or rather was first used in the flour we tested for alum in making our experiments and the result showed that there was a free acid after the reaction, so I am safe in saying that no matter where it is used, that is, either in the baking powder in excess or in the flour for the purposes of adulteration you will find alum or its equivalent in the bread, that is to say, it will be there either as alum or as sulphate of aluminum and sulphate of sodium which would practically have the same effect.

Q. So that you think if there was an excess of alum over and above the amount necessary to decompose the sodium bicarbonate free alum would exist in the bread? A. Yes, I think there is no doubt about that.

Q. Let me first ask you, would it exist in the residue, that is to say, would it exist in the dough before the bread is baked? A. Yes, sir.

Q. Then would it exist in the bread after the bread was baked? A. There might be some combination with the proteoids.

Q. If that be so is it true that it will be found in the bread that has been baked as well as in the dough before the bread is baked? A. I think so.

Q. Will such residue in the bread in your opinion be soluble in the stomach? A. I am inclined to think, I have made no experiments on that point, but I am inclined to think it would be difficult for all of the alum to escape absorption. I think some small part at least would be absorbed and it is a question how much would be absorbed. Lactic acid is so frequently present and the salts of aluminum are so readily soluble in lactic acid that the peptonoid and soluable proteoid combinations are formed. I think it is hardly probable that all of the alum would escape absorption, that is to say, some of it at least would be absorbed.

Q. Absorbed into what? A. Taken into the circulation through the walls.

Q. Of the alimentary tract? A. Yes, sir.

Q. What determines the relative poisonous properties

of the salts of aluminum? A. Their solubility and absorbability.

Q. Their absorbability by what? A. By that I mean that they are more poisonous as they are the more readily taken into the circulation through the walls of the alimentary tract. It depends of course on the condition of the intestines to some extent. I remember we made one experiment of feeding rabbits on soluble salts of aluminum—fed by the mouth—and a small per cent. of the rabbits must have had the salts absorbed because they were poisoned and died while in other cases they were not poisoned. Most of them I would say will escape, some of them will be poisoned.

Q. So that as I understand your testimony the poisonous qualities, or rather the relative poisonous qualities depend upon their solubility and absorbability? A. Yes, sir.

Q. Is it or is it not in your opinion true that all of the absorbable salts of aluminum are harmful? A. I certainly think they are.

Q. It is your opinion that all of the absorbable salts of aluminum are harmful? A. Yes, sir; that is my opinion.

Q. Is it your opinion concerning Doctor Smith's testimony that he has shown there that no part of the alum used in the baking powder was absorbed? A. He has not shown anything of that kind certainly.

Q. That is to say it is your opinion, based upon his deposition that he has not shown that no part of the alum used in the baking powder was absorbed? A. He certainly has not shown that in his deposition. As far as the deposition goes there is nothing to indicate that. The alum may have been absorbed.

Q. In your opinion did his experiments throw any light upon the subject of the poisonous properties of aluminum one way or another? A. I don't think they did. They throw no light whatever on that subject one way or another.

Q. Did you ever have occasion, Doctor, to examine the contents of the stomach of a person in a poor condition of health? A. Almost daily, certainly several times a week I have had occasion to wash out the stomachs of persons in a poor state of health for the purpose of examining the contents.

Q. What can you say about the presence of lactic acid in the stomach contents? A. Lactic acid is almost invariably

found in the stomach of persons suffering from some form of indigestion, that is to say, when I have washed out their stomachs and examined the contents I almost invariably find lactic acid present if the person is suffering from some form of indigestion. I will state as my opinion that lactic acid is found in nearly every stomach during certain stages of digestion and certainly in the majority of cases where a person is suffering from indigestion.

Q. You think it is almost invariably found in the stomach where the person is suffering from indigestion? A. Yes, sir; it is almost invariably present in the stomachs whose contents I have examined after washing them out and I think in nearly every stomach it is present in some stage of digestion.

Q. What can you say if anything more about the probable formation of soluble compounds with the protenoids? A. You mean the formation of soluble compounds by the soluble aluminum salts with the protenoids?

Q. Yes, you have stated that there was probably formed some soluble compounds with the protenoids? A. Yes, sir; I stated that as my opinion.

Q. How frequently are they formed in the stomach? A. I cannot say as to that. That is impossible to tell, but I know that certain salts of aluminum have a strong tendency to form soluble compounds with the protenoid substances.

Q. Doctor is the secretion of the gastric juice stimulated by the introduction of the tube into the stomach, that is the tube of the stomach pump as it is called? A. Yes, sir; any substance of that kind that would tend to irritate the stomach, that is the mucous membrane of the stomach, would cause a stimulation of the secretion of the gastric juice and it was in that way that Beaumont first obtained a pure gastric juice from the stomach of Alexis St. Martin. That is to say if anything irritates the mucous membrane the flow of the gastric juice is stimulated.

Q. Doctor, did the gastric juice in the cases of Doctors Irish and Ross mentioned in the deposition of Doctor Smith show the normal amount that would be secreted in the stomachs of those person or is it possible that the introduction of the stomach pump caused a greater flow of the gastric

juice than would have been found in the stomach if it could have been removed in any way without causing irritation? A. There may have been more and undoubtedly was more than would have been found in the stomach if the stomach pump had not been used.

Q. As I understand it then the introduction of the tube of the stomach pump irritates the mucous membrane and causes a greater flow of the gastric juice so that the amount that would be obtained on removing the contents of the stomach that way is greater than the amount that would have actually been present in the stomach had not something been done to stimulate the secretion? A. Yes, sir.

Q. Then as I understand it the effect of introducing the tube of the stomach pump into the stomach of those two persons would stimulate the flow of gastric juice and the conclusions that Doctor Smith drew from the amount of gastric juice he found are not correct because there was as a matter of fact more gastric juice obtained than would have been ordinarily in the stomach? A. I should not attach very much importance to the result of his experiments, and I think under the circumstances they are hardly worth considering.

Q. Doctor, I will ask you to look at this article in No. 185 of the Scientific American of July 19, 1879, which counsel read to Doctor Prescott when he was on the stand. If you have read it and rae ready to make your answers I will put my questions, but if you are not familiar with it I wish you would read it carefully and then I will question you concerning it? A. (After sometime devoted by the witness to the reading of the article in question.) I have read it over very hastily. I did not hear it when it was read before to the witness. I know nothing about this Mr. Patrick who seems to have been a Professor in the University of Kansas. I do not think any importance can be attached to that article because at that time, and he is not to blame for not knowing it, the presence of hydrochloric acid in the stomach had not been fully settled and therefore I cannot attach any importance to his article.

Q. Do you know anything about Professor Patrick? A. No, sir.

Q. You say that at the time he made those experiments, according to the date of the article, that he did not know the composition of the gastric juice? A. Yes, but that was probably not his fault as many did not know it at that time. In the light of subsequent investigations and the discoveries resulting from those investigations I should attach no special importance to the article.

Q. Doctor does the residue left in the bread made with alum baking powder serve any useful purpose in the animal economy when such bread is consumed as food by human beings? A. No, sir; it does not.

Q. Do you then consider alum baking powders healthful and wholesome when used in the preparation of human food? A. I do not.

Q. Does the residue left in the bread made with cream of tartar baking powder serve any useful purpose in the animal economy when such bread is consumed by human beings as food? A. There is a certain amount of benefit derived from the residue in that it takes the place and serves to some extent the purpose of fruit acids which have a tendency to prevent such diseases as scurvy.

Q. Is the residue left in the bread made with cream of tartar baking powder a wholesome and healthful constituent of the human food? A. I think so, if not used in excess.

Q. Do you consider cream of tartar baking powders healthful and wholesome when used in the preparation of human food? A. I do.

Cross-examination.

By Mr. Seddon: You have given years of study to the question of food and particularly the use of bread as food, have you? A. I have given years of study to foods in general.

Q. You stated that your researches not only extended throughout this country, but also you visited Cuba and learned something of foods there? A. Yes, I had the pleasure of going to Cuba. It has been my business to investigate foods and as a matter of course the use of the different kinds of breads along with other foods.

Q. You have made many experiments you say? A. Yes, sir; many scientific experiments regarding these matters.

Q. And this question of foods has been your specialty, so to speak? A. Yes, sir; I have made a special study of those things.

Q. Did you know Doctor McMurtry here before you met him in the trial of this case? A. I think I met him once or twice, but I cannot say that I knew him very well.

Q. You say you had only met him once or twice? A. Yes, sir.

Q. How did you happen to be a witness in this investigation? A. Why I was asked to become a witness.

Q. Why were you asked to become a witness? A. Because they wanted my testimony.

Q. By whom were you asked to become a witness in this case? A. By Dr. McMurtie.

Q. What are your duties at Ann Arbor? A. I am the dean of the Medical Faculty and do routine work there in addition to any other work that I may have on hand.

Q. You are engaged there with your duties constantly are you not? A. Well, with my duties there, making scientific investigations and such work as that keeps me pretty well employed.

Q. You are a pretty busy man then? A. Yes, I am a thoroughly busy man.

Q. You are constantly at work? A. Yes, I always manage to keep myself employed at something.

Q. I will ask you whether you are paid anything in connection with your trip to St. Louis to testify in this case? A. Of course I am paid for my work. That is what I am here for.

Q. What are you paid? What are your arrangements if you have no objections to telling them?

Mr. Cunningham: If Judge Seddon will state that he wishes to show that there has been any attempt to bribe this witness by the payment of money or to exert any undue influence over him to give false testimony in that way why I have no objections to the question, but unless he has some object of that kind I certainly shall object to the question.

Mr. Seddon: I think the Court will see the bearing and certainly I disclaim any intention of endeavoring to show anything of that kind. The Court can see that it has a bearing aside from that.

The Court: I will make the same ruling here that I have made when other questions of this kind were asked. The witness may state what his arrangements are if he has no objections to stating them and if he has any objections to stating them I will not ask him to answer the question.

The Witness: I have no objections whatever to answering the question?

Q. What are your arrangements then? A. I am paid one hundred dollars a day while I am away from home and expenses which is one-third of what the City of New York paid me for expert work.

Q. What is that? A. That is one-third of what the City of New York paid me for expert testimony.

Q. Did Doctor McMurtrie have anything to do with your testifying in New York, as you speak of? A. No, sir; I did not know Doctor McMurtrie and had never seen him at that time.

Q. You have been here twice have you not? A. No, no; only once. Just this time.

Q. You have been in consultation and conference with Doctor McMurtie who has been assisting my friend Major Cunningham in this case, have you not? A. Certainly I have talked with Dr. McMurtie and Major Cunningham about the case.

Q. Have you had any discussions with them or made any suggestions as to how certain matters could be brought out at the trial of this case? A. I certainly have discussed the matter with them. That is what I am here for. I had a talk with Dr. Mallet and Doctor Prescott just incidentally about the case, but there was no discussion among us as to what our testimony would be.

Q. What I mean is did you talk to Dr. McMurtie about it? A. Yes, sir.

Q. I suppose you suggested certain points to him, did you not? A. Certainly, certainly.

Q. That would be useful to them in making a strong case? A. I endeavored to give them all the assistance I could.

Q. And you were requested by Doctor McMurtie to come here? A. Yes, sir.

Q. Do you look to him for your compensation? A. Yes, sir.

Q. If you were asked, Doctor, whether there was alum in the water, how would you answer that question? Would you answer that there is alum in the water or there is no alum in the water? A. You refer to potable water now?

Q. Yes, of course. A. No, there is no alum in potable water.

Q. Do you say there is no alum in potable water? A. I never heard of any alum in potable water.

Q. Probably I should have said salts of aluminum? A. Well, salts of aluminum have been found in potable water, but the amount as I have already detailed in my testimony is so extremely small that it could not be considered at all.

Q. How much did you state was the most that had ever been found? A. The most that I ever heard of was one part in a million. I think though that most reports only show a fraction of a part in a million.

Q. You would draw a distinction then between alum and salts of aluminum as present in the water? A. Certainly. Alum as alum is never found in water that way. It might exist there in the form of some of the salts of aluminum, but when dissolved it would never be there as free alum. I know of no reports indicating that free alum was ever found in any potable water. It always exists, as I stated before, in the form of some salts of aluminum and then in quantities so very minute that it is scarcely appreciable. It is practically only a trace.

Q. I suppose every scientific man knows that alum is readily dissolved in potable water, do they not? A. It is a fact well known among men who know anything about these matters that alum is soluble in water or fairly so.

Q. Did you testify before Senator Mason's Pure Food Committee? A. Yes, sir.

Q. How did you happen to be called upon to testify there? A. Why I know of no particular reason except that they wanted my testimony and I received a letter from Senator Mason in which he asked me if I would testify and that was the reason why I went.

Q. Did Doctor McMurtie request you to go there? A. No, sir.

Q. Did Doctor Prescott say anything to you about it? A. Doctor Prescott told me that Dr. McMurtie wanted me to come over.

Q. You say that Dr. Prescott stated that Dr. McMurtrie wanted you to come over? A. Yes, sir.

Q. I suppose you went there upon he payment of your expenses the same as Dr. Prescott? A. Yes, sir.

Q. Dow, Doctor, have you ever analyzed any bread that was prepared or cooked with alum baking powder? A. No, I have not alalyzed any bread that was cooked with alum baking powder.

Q. You say you have not? A. I have not.

Q. You criticized Dr. Smith's statements to the effect that the aluminum hydrate as a residue left in the bread from the use of an alum baking powder would have a tendency to form insoluble compounds with the gluten, mucedin and glyoden that appear in the bread as coming from the wheat? A. I do not know that I criticized him. I stated that if it did form insoluble compounds those substances would be digested.

Q. Why do you say you criticized his testimony in that respect? A. Well I wish to state in connection with that matter that Doctor Smith's statements are misleading.

Q. In what way are they misleading Doctor? A. Because he says they form insoluble compounds.

Q. Why do you criticize his testimony? What interest have you in what he may have said? A. I was asked as a scientific man to go over his testimony and make such criticisms as I though justifiable in making regarding his testimony and his investigations as reported in the testimony.

Q. You admit his statement then when he says that his experiments tended to prove that it was insoluble in the stomach? A. He did not state anything about what it would do in the stomach. He told part of the truth and I want to tell the whole truth.

Q. Yes you wanted to tell the whole truth if it would have some importance in sustaining the case of the State I suppose? A. I think I was sworn to tell the truth and the whole truth and therefore I have stated as fully as I can anything that I thought would have a bearing on this case.

Q. Have you ever conducted any actual experiments with bread cooked with alum baking powder and eaten it or or fed it to others for the purpose of seeing what effect it would have upon the health and the digestion? A. No, sir; I never have.

Q. When you speak about alum being present in the bread, in answer to Major Cunningham's questions, did you refer to alum as burnt alum or alum crystals? A. I referred to burnt alum.

Q. You say you referred to burnt alum? A. Yes, but as far as the action on the stomach is concerned or the human system is concerned it would not make any difference which was used.

Q. Did you mean the calcined crystals when you said that there was sixty-two and a fraction grains of alum in a loaf of bread? A. I did not say that there were sixty-two and a fraction grains of alum in a loaf of bread.

Q. What was your testimony in regard to that matter then? A. We were speaking about the amount of bread necessary to produce about eighteen ounces of carbohydrates that would be required by an individual in twenty-four hours and I stated that in the absence of any other food which would give the carbohydrates that a man would have to consume thirty-two ounces of bread every twenty-four hours to maintain the normal amount of carbohydrate and in that connection I stated, giving the figures in detail that that amount of bread would contain sixty-two and a fraction grains of alum if cooked with the ordinary alum baking powder.

Q. What I mean to ask is did you find that alum there, as calcined alum? A. Yes, it was free from water.

Q. You speak of alum springs in Virginia and various alum springs throughout some other parts of the country, don't you know as a matter of fact that people resort to those springs when they are in ill health for the purpose of drink-

ing the water? A. I have heard in a general way that people go to those places.

Q. Did you never drink of the water from one of those alum springs? A. I never drank of the water, I have tasted it. It is not a very delectable drink.

Q. You say that you have tasted it? A. Yes.

Q. From what springs? A. From the springs of southwest Missouri.

Q. You never drank it to any extent? A. I never drank it at all. I merely tasted it. I stated that it is not a very delectable drink.

Q. You know as a matter of fact that people go to those places for the purpose of drinking the water to restore their health do you not? A. I am aware that it is used to some extent as an application for old ulcers and syphilitic sores and so forth.

Q. It is used internally is it not? A. I think only to a very limited extent.

Q. Don't you know as a matter of fact, Doctor, that many people resort to the alum springs of Virginia and use the water entirely internally and in fact live there for months at a time drinking that water exclusively? A. I have never been there so I cannot say to what extent it is used internally.

Q. Don't you know as a matter of fact that people stay there months at a time and take that water regularly for their health? A. I heard they do, I don't know anything about it.

Q. Doctor, do you know how much Rochelle Salts there is in a Seidlitz Powder? A. No, I cannot tell you how much Rochelle Salts is in a Seidlitz Powder. I was afraid you would ask me that question.

Q. It is the active laxative or purgative principle of the Seidlitz powder isn't it? A. Yes, sir.

Q. Do you know whether or not there is an aluminum compound present in a mother's milk? A. I cannot say that there is aluminum salts of any kind in the mother's milk. I think I am pretty familiar with the composition of that milk and if there is anything of that kind it is something new to me.

Q. If reputable authorities state that there was you would not be able to deny it from your own knowledge would you? A. I would not deny it from my own knowledge nor would I accept the statement as true. I would want to confirm it in some way before accepting such a statement as that.

Q. I suppose, Doctor, a great many conclusions which you have drawn regarding this question of alum and aluminum salts and their effects upon the human body have been drawn not from actual experiments and observations made by you but from the learning on the subject which we have been discussing? A. Yes, sir.

Q. And I suppose you have based your testimony and announced your conclusions on what you consider the weight of authority on these matters? A. Yes, sir; I have testified according to the weight of authority as I understand it.

The Court: Doctor, I would like to ask you a few questions regarding this matter: Assuming that the patient was a person of normal constitution and should take bread baked by the use of alum baking powder which contained, as a residue from the baking powder, aluminum salts in the quantity you have stated in your testimony, say for a period of months and years, what in your opinion would be the effect of those aluminum salts so taken, on the general health of the person and the digestion of the subject? A. I don't think you could lay down any general law applicable to everybody as to what extent the salts of aluminum are absorbable through the intestines, therefore, it would be hard to state the effect of the general proposition.

Q. But that is just the whole question. I have presupposed a person of normal health, what you would call an average person. A. I do not know because I do not know how much of the aluminum salts in the bread would be absorbed. That would depend upon the amount of lactic acid that would be present and the amount of soluble absorbable compounds with the protenoids. I may state that it will practically be impossible to state the exact effect under the circumstances detailed in your question.

Q. You say it would be impossible to tell just what the effects would be? A. It would be impossible to tell under those circumstances.

Q. Do you mean to say that therefore the salts would have no ill effects or what is your testimony on that point? A. No, I didn't state that. My testimony is that it would be impossible to tell under those circumstances what the effects would be. There might be some disturbance of the digestive functions. Q. What, in your opinion, would be the effect under those circumstances? A. Well, I must confess that I cannot answer the question because in some cases it might not have the slightest ill effects and in other cases there might some disturbance of the digestive functions. It would be impossible to lay down any general proposition governing those cases.

Q. In your opinion would any human being be affected injuriously or otherwise by it? A. I think in all probability he would.

Q. In what manner would such person be affected? A. From what we know from experiments upon animals a person would probably slowly develope some disease of the spinal cord—that would most likely be the result.

Q. Has there ever come under your observation any case of that kind during your twenty-five years of practice which you attributed to that cause? A. I have seen cases for which I could not assign any cause.

Q. Do you mean by that then that you would assign the use of baking powder containing alum as the cause? A. No, I would not like to say that.

Q. Did you in all of your twenty-five years of experience ever have a case of that kind which you attributed directly to the use of alum in baking powder? A. No, sir; I cannot say that I ever had such a case.

Q. In the course of all your reading and getting information from books of science on this question have you ever seen recorded a case such as you have described which would be attributed to the use of alum baking powder in the preparation of food? A. No, sir.

Q. Then your opinion as to the deleterious effects of alum baking powder is based upon theoretical propositions? A. Entirely theoretical and experiments upon animals from which we judge of the effects on the human system.

Q. Then your statements are not based in any wise upon cases that have come under your individual observa-

tion or that you have seen recorded in books? A. No, sir; from experiments on animals.

At this stage of the hearing an adjournment was taken to Monday February 12, 1900, at 10 a. m.

Pursuant to adjournment, on February 12, 1900, the Court met and the hearing of the case was resumed.

PAUL SCHWEITZER, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham: Please state your full name? A. Paul Schweitzer.

Q. Where do you reside? A. In Columbia, Mo.

Q. What is your occupation? A. I am a professor in the State University.

Q. Professor of what branch or department? A. Of the chemical department.

Q. Of what schools and colleges and institutions of learning are you a graduate? A. I took my degree at the University of Goettingen; I had studied at other universities previously.

Q. What other universities? A. The University of Berlin, I was subsequently the assistant of some of the professors of chemistry there, Heinrich Rose and Sonnenschein.

Q. What degress, if any, have been conferred upon you by institutions of learning? A. The University of Goettingen conferred upon me the degree of Doctor of Philosophy, the University of Missouri, three or four years ago, conferred on me the degree of Doctor of Laws.

Q. Of what scientific bodies are you a member? A. I am, at present, a Fellow of the American Association for the Advancement of Science, I am a member of the Association of Official Agricultural Chemists, I am a member of the New York Academy of Sciences, I am an honorary member of the Missouri Pharmaceutical Association; that is all I remember at present.

Q. What has been your career or work and experience in the line of your profession? A. My chief occupation has been in the direction of studying the methods of analytical chemistry and the application of these methods to certain technical questions, and, in addition to that, teaching various branches of chemistry in Columbia.

Q. During about what period has you work and experience of that kind continued? A. I would say about forty years.

Q. Have your work and studies been directed at all to the subject of food and the adulteration of food? A. For thirty-five years.

Q. Please state in what way? A. I was a teacher from 1867 to 1872 in the School of Mines Department of Columbia College, New York, and during that time my spare moments were engaged in solving questions connected with the health of the city through the city Board of Health, and ever since the time I came to Missouri in 1872 my attention has been given largely to sanitary chemistry which I have represented in the State University ever since it formed a special branch of study there.

Q. Have your works and studies, including your personal investigations, led you to any general conclusions or principles regarding wholesome and unwholesome foods, or food preparations? A. Yes, in general, I would say that my principals would call upon me to question the wholesomeness of any article that is not naturally a constituent of the foods that we take.

Q. Have your attention and your work and studies been directed to the subject of the use of alum in the preparation of food? A. To some extent for about 33 years.

Q. Have you, during that time, kept yourself familiar with the scientific literature on that subject, with treatises and published articles of leading scientists? A. I have endeavored fairly to keep abreast with the literature on the subject.

Q. What, if any, researches, tests and experiments have you made to determine the results of the use of alum in the preparation of human food? A. The three articles of human food that have come under my notice as containing alum, and in which I have found it, are some baking powders, pickles and wine.

Q. What if any, conclusions have you reached as to whether or not the use of alum in the preparation of food for man is wholesome and harmless? A. I have not made any experiments or investigation in testing that question on my own body or the bodies of other men; I take the statement of the toxicologists and the authorities in sanitary science condemning the use of alum, with my knowledge of the astringent properties of it, as sufficient to warrant me in condemning it wherever it is found in any article of food.

Q. Please state whether or not there is a uniform consensus of medical men and scientists to the effect that alum used in the preparation of food is wholesome and harmless? A. I would say that that is the opinion of the medical profession.

Q. What is the opinion of the medical profession? A. That alum is objectionable in any article of food because it is unwholesome, producing, among minor evils, constipation and dyspepsia.

Q. Have you read or heard read, the depositions of Dr. Ernest E Smith and Dr. Austin Flint given in this case? A. I have read the depositions.

Q. What, if any, criticisms have you to make on the methods of their experiments and upon the conclusions they have reached from those experiments? Please state these criticisms in your own way? A. It is not pleasant to be called upon to criticise one's brother scientists, but where the question is, as stated by Dr. Smith, to be one of facts, I presume that the facts will have to stand scrutiny. The deposition of Dr. Smith states, on page 8, that the first experiment "was undertaken to determine the digestible nitrogenous matter and albumenoid nitrogen in the Layton bread and in the control bread by laboratory method," and Dr. Smith says, on page 10, "I concluded from this experiment that the practically complete digestion of the nitrogenous matter in Layton bread, when subjected to pepsin-hydrochloric acid action, was possible and did occur," and, further, "The digestibility of the two breads is practically identical." In order to ascertain the matter I have put my statements in as condensed language as I can, and will hand the papers down. I deny these conclusions can be drawn from the experiment as described, because,

First: The sampling of the bread was done improperly. The crumb contains less soluble mineral matter than the crust, and, if alum be present, would contain less of this, the very substance that is on trial.

Second: The experiment was carried on too long, forty-eight hours, thereby eliminating the possibility of ascertaining the rapidity of digestion, which might have been much greater in the case of control bread, and is one of the factors by which we measure digestibility; an equal quantity of food material derived from two sources, the one digested in two, and the other in four hours, justifies the considering the one twice as digestible as the other.

Third: The analytical methods for ascertaining the data upon which Dr. Smith bases his opinion are, in part, impossible of execution and, in part, defective.

For example, Dr. Smith, on page 9, states that, "analysis was made of the amount of nitrogenous matter in solution and remaining undigested," "of both the filtrate and the residue on the filter." The fact is that one gramme of pepsin contained nearly twice as much nitrogen as the two grammes of bread, so that the method, even supposing that this large amount of nitrogenous matter underwent, during the forty-eight hours, exactly similar and proportionate alterations in the two cases, which is not likely, and certainly not known, must, on general principles be condemned; besides, this is never the method practiced by those who are at present doing much work in this line. On the other hand, the amount of nitrogen in the residue is too small to warrant drawing any conclusions from, its weight is 3-10 of a milligram. I could illustrate the amount, if it is desired, and I have some substances that would weigh exactly that amount. The amount of pepsin taken for the two trials is so much in excess of what was needed that it could have digested the protein from 1936 times the weight of the bread taken. It is evident that under these circumstances the results can have no value, in proof of which I could cite a number of experiments. These experiments prove that good wheat bread is only digestible to the extent of 80 per cent., while in the

laboratory experiments the digestibility was nearly complete.

The statement of Dr. Smith at the beginning, claiming the aim of the experiment to be a determination of the digestible nitrogenous matter and albumenoid nitrogen is nowhere verified, or further mentioned; the two are, of course, not identical.

These are my objections to the first experiment.

The second experiment on page 11 was undertaken to determine the influence of food raised with the Layton baking powder on the processes of secretion of gastric juice, on which Dr. Smith finds, on page 14, "My conclusion was that the alum bread did not in any way interfere with the processes of secretion of gastric juice in the stomach."

I deny that any such conclusions can be drawn from the facts as reported, because,

First: The influence on the processes of secretion of gastric juice, embracing necessarily also a determination of its quantity in a given time, or under given conditions, is not touched upon at all by Dr. Smith, and leaves one-half of the problem untouched; and,

Second: The other half—the testing of the quality of the gastric juice—is not done properly; for, evidently, to test the relative quality of the gastric juices of two persons there must not only be taken equal volumes of these juices, but they must be taxed as to their respective digestive power, to their limit of digestion. Instead of two-tenths of a gramme of moist albumen there should have been taken at least five to ten grammes. At the rate of five cubic centimeters of the gastric juice there is digestion of only two-tenths of a gramme of coagulated moist albumen, and the gastric secretion of a normal man during the twenty-four hours, having three meals, would have to amount to six gallons, or twenty-four quarts.

Third: The bread which was the test object was bad and remarkably bad because it contained more water than any recorded for good bread, and remarkable because it contained more water than the dough out of which it was made.

The third experiment, on page 14, was conducted to ascertain the coefficient of availability, meaning digestibility of a diet containing food raised with Layton baking powder, on which Dr. Smith finds, on page 22, "My conclusion is that the two breads are equally digestible and have the same value to and action upon the human system."

I assert that these conclusions are not warranted by the facts, because.

First: The diet was not a full and nutritious diet, as is asserted on page 17, but was a starvation diet, during which every organism makes great efforts at digestion and appropriating what it otherwise would reject. In addition, during the trial with Layton bread, the starvation was more marked than in that with the control bread, and was consequently in favor of the Layton bread.

Second: The amounts of ethereal sulphuric acid in the urine during the two experiments if they prove anything at all, prove that there was more putrefaction in the intestines during the Layton bread period in the proportion of 105.3 to 100, owing, perhaps, as suggested on page 21, "to indigestion by which food material passes into the lower intestinal tract, and, as a result, putrefies, which should not have done so."

Third: The metabolic intestinal nitrogen is not subtracted from the total nitrogen of the feces to give the real undigested nitrogen of the food; its quantity is very considerable and would, if taken into account, reduce very largely the amounts of undigested protein reported—9.1 per cent. and 10.1 per cent. (on page 22) of the whole food which, falling almost wholly upon the breads, would give values at variance with those found by all other investigators.

I presume I will be called upon to verify these statements. Unless I am called upon I will pass them over. I find on page 63 a statement to the effect that alum is contained in bread or flour. The existence of alum in flour has been discovered in English preparations, for nearly 60 years, and the authorities that have especially investigated state the origin of it as being owing to dust and dirt of the wheat berries before grinding and the materials of burr stones which, in grinding, is reduced to powder, and though at the present day the roller mill process has nearly completely superseded the burr stone mill process, a certain proportion of dirt or clay invariably adheres to the wheat. I have stated the presence of alum, but the presence of alum is scarcely ever ascertained as such, it is ascertained as alumina, and, by calculation, the amount of alum corresponding to it is given. The writers state, and I cite only one, A. W. Blythe, Foods, Their Composition and Analysis, Fourth Edition, London, 1896, who, on page 206, says, "It is certain that, properly cleaned, wheat contains no trace of alumina."

I have examined myself the reported ash analysis of wheat and of flour amounting to many hundreds, and have never found the presence of alumina reported in any, but that does not mean to say that alumina may not be present in some inferior grades of flours. I also find stated on page 71 that alum is a universal constituent of water. I have had a very large experience in the analyses of water, perhaps larger than any other man in Missouri. I have examined the reported analyses of mineral and potable waters in the United States, and have the published volumes of three authors here, and I find that, with the exception of those waters that are real alum waters, and those waters that contain quantities of sulphates of iron and no carbonates, which also contain alum, there is no properly made analysis reported that gives the presence of alumina in any form than as alumina, not as alum.

As to the possibility of alumina being dissolved in water without the aid of an acid, any chemist who has much worked with determinations of alumina, either from water, or any other substance, will recognize the existence of the fact. It

is one of those few substances which is prone to dissociate, that is to sever itself in a measure, from acid, and become water soluble. In that condition its properties are entirely different from the properties of common alumina.

By Mr. Seddon: What? A. Its properties, in this water—dissolved condition—are different from the properties of alumina dissolved by the aid of an acid. So much for the testimony of Dr. Smith.

By Mr. Cunningham: Before you leave that subject, Doctor, have you any criticism to make upon the fact that Dr. Smith does not state what amount of alum or alumina he started with, nor does he state what amount of alum or alumina he found in the excreta? A. The objections that I have made to Dr. Smith's three experiments are such as must indicate to a chemist my unwillingness to accept any of his conclusions. I have not stated, in my criticisms, what he should have done. I have criticized the methods that he pursued, and, in a few essential points, where he omitted essential determinations; further than that I don't feel called upon to enter into Dr. Smith's testimony. You asked the question as to what criticisms I have to make upon Dr. Smith's and Dr. Keiser's testimony. I have not spoken of the fact presented by Dr. Keiser. In looking over his testimony I have come to the conclusion that it must contain some inaccuracies. The statement that I wish to discuss chiefly is the one in which he ascertains the presence in a 14 ounce loaf of bread of 9.89 grains of aluminum hydrate. I have made that calculation; the amount of aluminum hydrate which he put in was 8.05 grains.

By Mr. Seddon: Have you not gotten that wrong? It was 7.85 grains? A. No, I have not gotten wrong.

Q. I mean he never testified— A. In these statements the values of the third decimal are probably omitted, .16—

Q. Professor, one moment, if you please. (Counsel for the State hands witness a paper). A. .16 of a per cent., I calculate .16 of a per cent. and I find it on page 11; .16 of a per cent. is 9.89 of a grain. In some parts of this testi-

mony the values are turned around, and on page 15 the statement is made that the bread received 122½ grains of baking powder, and that the baking powder contained 20.4 per cent. of alum. Making that calculation I find that it amounts to 24.99 grains of alum, which corresponds to 8.05 grains of alumina hydrate. The values that are given in the testimoney elsewhere differ from this, but very lightly differ, and there is no need of taking exception to the values that I have here. Now, then, the points I wish to make are these: On page 10 the statement is made, "I first mixed with dry flour two per cent. of Layton's baking powder" and further, "taking the two per cent. of Layton's baking powder, I mixed it thoroughly with the dry flour;" and, on page 14, "the average baker's loaf weighs 14 ounces and in the loaf which I made, which weighed 14 ounces, I estimated, in fact I weighed the amount of baking powder which was two per cent. of the weight of the loaf of bread." Since both of these statements are made, I am somewhat doubtful which to take as the correct one, especially since it seems to me impossible to mix with flour such a weight of baking powder that, after the flour has been made into dough and the dough baked, the resulting loaf will just contain two per cent., for the reason that no one can fortell the weight of bread that is derived from a certain weight of flour. I can conceive that a certain quantity of flour may be taken and so much baking powder mixed with it that the product, whatever the weight is, will contain two per cent., then neither the flour nor the bread may be weighed, but in order to calculate the exact amount of alumina in the baking powder that was put in the bread it would be necessary to elucidate the point, but I come now to the point which is that virtually two more grains of alumina were found in the loaf than was put into it. The accounting for these two grains additional can, of course, be done in two ways, one is that it came from the flour, and the other is, since these values are very small if only one determination had been made there might have been an error and the determination would have to be repeated. As to the means of getting this nearly ten grains of alumina out of the loaf which were adopted, that is by treating the loaf with dilute hydrochloric acid and then filtering it through parchment paper, I doubt whether the alumina could wholly pass through the parchment paper.

By Mr. Cunningham: Doctor, pardon me a moment; I will ask you now if you are speaking of the acid solution of the bread, or the water? A. No, the acid solution of the bread.

Q. I will ask you if you understand Dr. Keiser to say that he passed the acid solution of the bread through that parchment filter, or whether his statement is that the solution that he passed through the parchment filter was the water solution? A. No, he made first a water solution, that, for the present, I have not mentioned at all, I pass on directly to the hydrochloric acid solution, and that he dialyzed, as I understand it, and in that dialyzed fluid he found about ten grains of alumina where virtually only about eight grains had been added to the loaf; am I correct in that, Dr. Keiser?

Dr. Keiser: Will you say that again, I did not hear the whole of your statement?

The Witness: My statement was that in the dialyzed fluid you found about ten grains of alumina where you added only about eight grains to the loaf.

Dr. Keiser: Yes, that was it, it came from the alumina phosphate in the flour.

The Witness: My statement was in connection with this, that I doubt whether such an amount of alumina would pass through the membrane, and my doubt on that question was based on two facts. One fact is that it is almost impossible to extract from any vegetable substance, even with acid, the total amount of ash constituent that it contains. I myself have made, I can say, thousands of determinations and I have never succeeded in extracting from any vegetable substance, even including flour and bran, the total amount of the ash constituents. My other objection is that I doubt whether such small amounts of alumina necessarily in the very dilute solution would pass through the membrane. I might explain this statement so that I may, perhaps, not be questioned subsequently. There are chiefly two substances that very readily disassociate, that is to say, that in

a solution very readily leave their acids, and those two substances are alumina and a similar compound of iron. We use a membrane for separating what are commonly called organic substances from what are called inorganic substances, or rather non-crystallizable substances from crystallizable substances, so that a crystallizable substance, if organic, will pass through a membrane just as well as a crystallizable substance that is inorganic; and the reason why some substances pass readily through a membrane while others do not is a simple physical one. Any membrane whatever its nature is, will permit nothing to pass through, which, in its smallest particles, is larger than the diameter of the pores, for if the membrane had absolutely no pores nothing could pass through at all; now, then, these disassociated bodies like sesquioxide of iron and aluminum have very large molecular volumes, and they are so large that they cannot pass through. If we take a solution of either of those two in hydrochloric acid and dilute it as largely as was the case with this solution, I do not think a great deal of aluminum will pass through. I am aware of the statement in citing Graham's experiments. I studied Graham very thoroughly more than thirty years ago, I made a number of Graham's experiments myself, and Graham merely says that in taking a rather concentrated solution of aluminum chloride and dissolving in it in addition, which is very peculiar, a large amount of hydroxide of aluminum, and then diluting, the aluminum that was subsequently dissolved remains on one side of the membrane while the aluminum chloride previously dissolved passes through, I am aware of that, but Graham never made any quantitive determination to determine whether the whole of the aluminum chloride would pass through. If the solution is very dilute then even in such cases the aluminum on disassociating assumes a gelatinous form of very large molecular volume and is retained on one side of the membrane.

Now, I do not wish to state or insinuate that Dr. Keiser's results, as he gave them, were wrong, but what I wish to say is that from my knowledge of the matter described, from the study of original memoirs and the reputation and work of some of the masters, I have come to the conclusion that such a determination as was made is very likely full of difficulties, and that an error in the determination, the

amount being very small, may have occurred, which can only be remedied not only by Dr. Keiser making half a dozen such determinations, but having a number of other chemists make the same determination with the same results.

As to the analysis of the baking powder that was made, I do not wish to criticize it. I know that starch cannot be properly determined in either of the two ways in which Dr. Smith determined it, but it is of no vital importance that the carbonic acid determined on pages 18 and 19 would not be permitted to be determined in that way by the masters, some of whom I have known, and they would shake their heads when told that this little apparatus was to be heated to near the boiling point and that only the gas escape and not a particle of the moisture and would let the oil of vitriol remain in the bulb. But these minor matters perhaps might just as well be left unsaid. These are the statements that I have to make in reference to the two testimonies that have been presented to me for examination.

Q. Dr. Keiser stated in his testimony which you have read that the volume 10.17 grains of hydroxide of aluminum would be about that of a pin head or grain of wheat or between the two. A. I have percipitated aluminum from such an amount of baking powder taken out of my can, not from Dr. Keiser's can, and I have it in my satchel here. Shall I present it (producing bottle)? In taking any substance that contains alumina in solution and precipitating it, it is well known it precipitates it in a gelatinous form that occupies very much space, but that even in the presence of water it gradually shrinks and becomes less and less. I precipitated this last Friday and if you let it stand here a few minutes you will see the aluminum hydrate shrink and it will be about half of this bottle full as it is in here.

Q. How much hydroxide of aluminum is in that bottle? A. The hydroxide of aluminum from 122½ grains of baking powder.

By the Court: What kind of baking powder? Where did you get the hydroxide of aluminum that is in the bottle? A. I obtained it out of such a baking powder—taken out of that can I think (referring to a can on counsel table.)

Q. Is this the can to which you refer (handing wit-

ness the can before referred to)? A. Yes, sir; that is the can.

Q. Where did you get that can? A. I received it on January 19th, at half past ten o'clock in my rooms in the University, the messenger happened to be there when I was there, and handed it to me.

Mr. Cunningham: I will identify the can by evidence hereafter if counsel desire as a can of baking powder purchased in open market in St. Louis and sent to Dr. Schweitzer.

The Court: What is the brand on the can?

Mr. Seddon: I have no objection if Major Cunningham says he will identify it later.

Mr. Cunningham: I submit to counsel and the Court that I had this purchased by Mr. Harris who then put his initials on the can, and had it sent in this wrapper to Dr. Schweitzer who says he received it in that way. A part of the label has been torn off, but it is "Baking powder manufactured by Layton Pure Food Co., St. Louis, U. S. A., Absolutely Pure:" a blue label.

Mr. Seddon: You will undertake to show that it is a regular can got in the market?

Mr. Cunningham: Yes.

Mr. Seddon: That is all right, we will not object to it at present.

The Court: I attach very little importance to this phase of the inquiry, I am not concerned on the question of whether ten grains of hydroxide of aluminum is as big as a pin head or as big as a base ball, I cannot see that it has any bearing on the question here, whatever its size may be. I am concerned on the question of its physiological effects.

Mr. Cunningham: Possibly a comparison of an ultimate physical fact with the opinion of Dr. Keiser might

operate to indicate to the Court how accurate the Doctor may have been in some of his other conclusions, I see nothing else about it myself. 10.17 grains is that much in weight whether bulky or compact, I understand that, but we had that statement from Dr. Keiser that it was about the size of a grain of wheat.

By Mr. Cunningham: Doctor, I will ask you one question. I understand Dr. Keiser to have said that he made a water extract or water solution of bread made with the Layton Baking Powder and having done so, he tested that water solution for alumina with ammonia, and that as he got no precipitate he concluded there was no alumina present; I will ask you what, in your opinion, is the conclusiveness of that test as to whether there was or was not alumina in that water solution? A. It would depend of course, entirely on how the test was made. If there had been present a small amount of alumina in the water solution and if the water solution from such a loaf of bread amounts to about a quart or so along with the organic matter, I venture to say that no alumina, even if it were present could be precipitated by the ammonia. That test may have been made in a different way. The only way to test for alumina in such a case would be to evaporate to dryness the solution and then test for alumina.

Q. Will you please look at Dr. Keiser's deposition where he describes the way he made that test and tell us then whether in your opinion, the test made in the way there described was a conclusive test or not? A. It merely says, "I then filtered off the aqueous extract and tested it for free alum or any soluble alumina compound," and by that I am not able to judge how the test was made.

Q. Will you please leave that subject for the present, we will come back to it in a moment, and tell the Court what tests and determinations, if any, you have made upon this subject of this alum baking powder? A. I thoroughly analyzed the baking powder in this can, which is, by the way, a very difficult thing to do.

By the Court: What can do you refer to?

Mr. Cunningham: The can which was sent to him by express and which I will prove later was bought here in the open market.

Q. You speak of this can? A. Yes, sir.

The Court: You had better have it identified and marked so that I can tell what is meant by the expression "this can?"

Counsel here puts on the can which the witness refers to, "Plaintiff's Exhibit 8," and asks the stenographer to mark on it his own initials J. F. A., which is done.

The Witness: I determined the sulphuric acid, the alumina, the insoluble residue, the silica, the soda and phosphoric acid and the starch. I made of each quite a number of determinations to bring out certain facts. I found that in the hydrochloric acid solution of the original baking powder I obtained a larger amount of sulphuric acid than I obtained from the ash of the baking powder obtained by incinerating it in the shape in which it is, but when I mixed the baking powder previous to incineration with a large amount of pure sodium carbonate and nitrate and then incinerated it and determined the sulphuric acid in this residue, I obtained the proper amount, that is to say, the same amount that I obtained from the hydrochloric acid solution after subtracting from that the insoluble residue which it contains. It contains 12.12 of one per cent. of sulphuric acid SO3; I likewise determined the alumina a great many times and I obtained 4.12 of one per cent. of alumina; the insoluble residue amounted to .62 of one per cent.; the soda to 9.05 per cent.; the phosphoric acid to .15 of one per cent., and of starch which I determined twice by the method adopted by the official agricultural chemist, I obtained 47.5 per cent. In calculating the composition of the baking powder upon these data, for the composition of any substance given is usually obtained by computation from analytic data, I found 18.16 per cent. alum; .62 per cent. of insoluble residue; 19.38 per cent. of bicarbonate of soda; .15 of phosphoric acid and 61.69 per cent. of starch, which I would say in practice amounted to 20 per cent of alum, 20 per cent of bicarbonate of soda and 60 per cent. of starch,

leaving it doubtful as to where this phosphoric acid that I found belonged. The phosphoric acid, as well as the insoluble residue were impurities probably existing in the alum. In making the calculation for alum which I have given, I find a less amount of sodium sulphate present than theory would require, and I venture to say that this commercial product is derived in such a manner as really to get into the trade with a less amount of sodium sulphate than that substance which mineralogically and chemically is commonly called alum.

Q. What is the taste of alum and what is its effect when taken into the mouth? A. Alum is classed by authors on therapeutics and materia medica as an astringent, producing the effects of astringents which are to coagulate albumenous matters upon the tissue of which they come in contact, to constrain or contract the tissues, the cells with which they come in contact, and if the cells are secretory cells to reduce the amount of secretions. These might be called local effects, but in addition to the local effects the alum would enter the circulation, being removed in ways that have been ascertained, through the kidneys and probably through the skin, and would produce an effect upon the blood corpuscles, and through the blood corpuscle upon the nerves which they touch. I have a number of references here of such authorities, but perhaps they need not be given now.

Q. If you will just state what your conclusions are and answer the question, then, as your authority for the statement, you may cite them? A. I have stated my conclusions in reference to the effect of alum on the system.

Q. What is your authority for that statement, if you choose to give it? A. I have a statement here made by J. Mitchell Bruce, "Materia Medica and Therapeutics" by Lee Brothers & Company in Philadelphia, preface being dated 1893. On page 77 it says, "Internally: The local action of alum is appreciated in the mouth as an astringent taste and in the throat as dryness, the mucous secretion of the parts being coagulated, and the membrane constringed, especially if it be inflamed and swollen. A similar effect is produced on the mucous membrane of the stomach and intestines, dyspepsia and constipation being the result."

I have another reference by Roberts Bartolow, "A practical Treatise on Materia Medica and Therapeutics," New York, 1887, Sixth Edition, page 314." "The sweetish taste of alum first experienced is quickly followed by a decided astringency. It provokes an abundant flow of saliva, and the albumen of the saliva buccal mucous is coagulated in whitish, membrane-like flakes, contraction of the capillaries, blanching of the mucous membrane and subsequent diminution of secretion take place, hence the dryness of the throat, thirst and constipation, which result from its use."

Liebig in "Familiar Letters on Chemistry," etc., edited by John Blythe, London, 1859, on page 459, says, "Since phosphoric acid forms with alumina a compound hardly decomposable by alkalies or acids this may perhaps explain the indigestibility of the London bakers' bread, which strikes all foreigners."

I have another reference, but I will not bring it in here as it would be very difficult or impossible to verify it.

Q. Now, returning to the question I asked a while ago as to your criticism upon the ammoniacal test of Dr. Keiser on the watery solution, I will ask you first to look at what Dr. Keiser has said, page 10, you have already referred to, on pages 38, 39, 40 and 42; now, are you able to say anything more than you havealreadysaid about the efficacy or the conclusiveness of that ammonia test? A. The point is this, I tried to make it before, this aqueous solution, even supposing it to contain a small quantity of alumina, would, if tested as such not give any precipitation with ammonia, but if it had been evaporated to dryness, ignited and the residue fused and then dissolved in hydrochloric acid and then tested with ammonia, it would have given the precipitate for alum and then might yet have been spoken of as an aqueous solution.

Q. Please state, if you know, whether or not there is a general popular prejudice against food containing alum? A. There has been quite a movement all over the United States against the suppression of adulterated foods and this has included also foods that contain alum. I myself have taken part in this State in increasing that agitation with a view of passing a national pure food law. There has been a practice for many years to add to the cucumber pickles

that are sold alum, I am not speaking of the copper to give them a nice green color.

Mr. Seddon: We have stood a good deal of this and I do not think the question of whether there is a popular prejudice affects the question at all, but when he goes into pickles, I think we ought to draw the line there.

The Court: The witness may answer the question affirmatively or negatively. He has gone into a great deal of collateral matter that is really not necessary in the case.

By Mr. Cunningham: Go on as concisely as you can. A. This alum is added to the pickles in order to harden them for use. It is according to my opinion, and, as I think, according to the opinion of the medical profession—

The Court: Is it not possible to continue the examination without giving a dissertation on pickles?

By Mr. Cunningham: The question is whether you can say there is or there is not a popular prejudice against the use of alum in food? A. On the part of those that are presumed to know something about it.

The Court: Answer the question if you know whether there is a general popular prejudice against alum in food, not among a particular class of people, but among the whole of the people.

The Witness: I think the whole of the people—the farming class with which I come in contact know nothing whatever about alum.

By Mr. Cunningham: Have you seen many packages of baking powder sold in the market? A. I very often have occasion to go to the grocery store in the little town where I live and I see cans of baking powder there and have some in our own house.

Q. Have you seen any marked or labeled as containing alum? A. Never.

Defendant's counsel objects to the question and the Court states that the question has been answered and that is an entirely immaterial point.

Q. If in alum baking powder there is an excess of alum above the amount necessary for the complete decomposition of the sodium bicarbonate, will alum in your opinion, be found in the residue? A. It is chemically possible to weigh off alum and bicarbonate of soda, knowing their exact composition, in such a manner as to have a resulting mass that will be neutral. This is, practically, very difficult, and in my experience with this baking powder I find that the aqueous extract of this baking powder as also the extract bread made from it, is slightly acid.

Q. Do you think the fact that it is slightly acid indicates the presence of alum. A. Not necessarily.

Q. If there is an excess of alum in baking powder would the bread made with that baking powder containing that excess of alum, in your opinion, contain alum? A. It would contain it undecomposed as alum.

Q. Would such residue or any part of such residue in your opinion be soluble in the stomach? A. The alum, or rather the alumina in the bread made from this baking powder, whether soluble or insoluble, would dissolve in the gastric juice.

Q. When you say whether soluble or insoluble you mean prior to introduction into the stomach. A. Yes, sir.

Q. And in water. A. Not in water, soluble I mean as undecomposed alum in some form in the bread; insoluble as commonly claimed in the aluminum hydrate; both of those substances would dissolve in the gastric juices.

Q. In the stomach? A. Yes, sir.

By The Court: By aluminum hydrate you mean hydroxide of aluminum? A. Yes, in the acid of the stomach. I have made an experiment, if I may describe it.

By Mr. Cunningham: Please do so. A. I baked a number of biscuits with alum baking powder; I broke them up and extracted what I could by means of a hydrochloric acid solution that contained as much hydrochloric acid as the gastric juice contains; I filtered the solution, boiled it

down, got rid of nearly the whole of the organic matter and crystalized it and the salts I have here; I separated them somewhat in some of the little bottles that I have here; the alum can easily be tasted; they all contain soluble salt of alumina which were precipitated by ammonia; they can be tasted in the mouth. These are the three quantities of salt, including soluble alumina, that I obtained from a number or biscuits, which on being baked had received about eight grammes of this baking powder.

Q. Was the amount of the baking powder that you put into the flour for those biscuits the amount that is prescribed on the cans, or usually put in? A. I used less than prescribed there because my teaspoon did not hold quite as much as the teaspoon of Dr. Smith and Dr. Keiser.

Q. How much to the pound of flour did you put of baking powder? A. The batches that I baked with 8 ounces of flour, just one pound, my flour weighed exactly 8 ounces to the pint; to that I put 6 grammes of baking powder whereas Dr. Smith used a little bit less than one-half of 17 1-4; Dr. Keiser probably used in that neighborhood, I could not tell.

Q. You think you took less baking powder to the flour than either Dr. Smith or Dr. Keiser? A. I did because I made previous experiments and I found the raising power was sufficient by taking less.

Q. After you had baked the bread how did you get the powder out of it? A. I took a number of biscuits, broke them up and put them in a large vessel with hydrochloric acid, that I stated contained just as much hydrochloric acid as the stomach secretions. I will tell you how I obtained it, I have a great deal to do with volumetric analyses and I had a 10 gramme normal hydrochloric acid solution and that hydrochloric acid solution contained 3.6 of a grain of hydrochloric acid to the thousand; that I diluted with its own volume of water so that I had a solution that contained ½ of 3.6, that makes it 1.8 in the thousand. The authorities usually give as the acidity, the amount of free acid, in the stomach secretion from one to three.

Q. Per thousand? A. Yes, sir; per thousand. This solution I permitted to stand over the biscuits over night; I filtered it in the morning and evaporated it down; it con-

tained a great deal of organic matter; I had it heated until the organic matter was fairly carbonized, then I filtered it and obtained a solution containing some little organic matter, to which I added a little hydrochloric acid to clear it and by boiling it down I obtained the crystals placing the watch glass in which the solution was, over one of the lamps that chemists have for evaporating water. I poured it from one watch glass to another. That was the way I obtained the different batches. There was sulphate of soda, hydrochloric acid and also some salt of alumina. In the small bottle I tried to get out the crystals that I thought were nearly pure alum and there is a taste of alum in these, that is a perfectly plain astringent taste. That is the way I obtained these three.

Q. Do you think in the bottle that contains the small amount where you say you detected the alum taste—do you say there is any alum in that? A. Yes, sir; it contained sulphuric acid, of course, that was not baking powder. There are the crystals themselves that I tried to pick out in the form in which alum usually crystallizes.

By the Court: Have you determined the weight of the residue that you obtained out of this solution? A. No, I did not.

Q. Then, as a matter of fact, you do not know how much of the alum and soda and other crystallized product you obtained out of those biscuits? A. After treating it with hydrochloric acid?

Q. Yes. A. There would some remain behind.

Q. You do not know how much was there and how much you got out? A. No, I meant to make all the tests, but my time was too limited and I could not make them.

By Mr. Cunningham: Does the residue left in bread by alum baking powder, serve any useful purpose in the animal economy when such bread is consumed by human beings? A. You asked me a question a while ago as to whether I had arrived at any general principles in reference to the healthfulness or unhealthfulness of food and I stated that my general principle in deciding against a food or a food product was that it was other than is contained in any natural food. Now, this baking powder, whether it contains the alum that is put into the food undecomposed or after

the action upon it by means of the bicarbonate of soda, brings into the food hydrate of alumina sulphate of soda and the acid from phosphoric acid, the hydrate of alumina is not contained in any animal diet that I know of, it is not contained in pure flour nor in any fruit, nor the sodium sulphate, and for that reason I would on principle pronounce against the use of any article of food that contains alum or alumina or sodium sulphate, without, of course, meaning that medicinally under certain conditions each one of those or all of them might be very advantageous.

Q. What is your opinion as to the healthfulness and safety of purifying or clarifying drinking water with alum? A. Not only my own general principle, but the principle of all chemists with whom I ever had to do is that in improving any article of food it is not best that anything should be added that is naturally objectionable, even if in doing so this objectionable substance is nearly wholly removed. I know that in a small way alum is sometimes used for purifying or clearing water. I have made a test myself. That (referring to the water in a bottle) is water as it comes out of our hydrants and it has been in this bottle ten or twelve days; and you see it does not settle. That used to be the character of the water that I found in this city. In taking this water and adding to the bucketful just three drops of the solution of alum which I have done and letting it stand, the three drops of alum will coagulate the impurities, and on filtering the water it becomes like this (referring to the water in another bottle). I made the tests some days ago. This (referring to the contents of another bottle) is the mud I filtered out and that illustrates another property of the alum that I have alluded to here already, the three drops of alum to such a quantity of water, a very small quantity forms such a dilue solution that the alumina separates itself from the acid and is soluble in water, but in that condition it readily unites with the coloring substances, with the clay and with other matters and forms a nearly insoluble compound. I made a number of tests in this case. If I take more than three drops I bring about the separation much quicker and when I filter the water a little alum is left in there. Two drops of alum will not coagulate it. I had two drops of alum and added it to such an amount of water, but

even after standing four or five days it did not coagulate it and I could not filter it. Three drops for this amount is the amount of alum to be used. Now, then, the alum that I added here contained in the three drops which is now contained in this bottle is so completely removed that if I were to take this solution and add a drop of ammona to it I would not get the precipitate from it showing the absence of alum, but if I were to take a quart of this and add a little hydrochloric acid and boil it down and ignite it and fuse it and then dissolve it again and test it with a little ammonia I would get a trifling precipitate of alumina. That shows the proposition. Originally this was full and I imagine in two months it will form a fourth and it will become as dense as in the little bottle.

Q. Now, then, what is your opinion about the healthfulness or unhealthfulness of clarifying drinking water with alum? A. Answering that particular question I would say that I prefer to drink the mud instead of the purified aluminous water.

Q. Why? A. When I first came to this state, all the water in this city looked like this (referring to the water in a bottle). I objected to it because I was not used to it in the East and I was always told it was extremely healthy. I object to alum on principle.

At this point a recess was taken until 2:30 p. m.

Cross-examination.

By Mr. Seddon: Professor, are you a medical man in any sense? A. How is that?

Q. Are you a medical man? A. Not in the sense that I practice medicine—how do you mean?

Q. I do not mean the old adage that if a man is not his own Doctor by forty he is a fool, but I mean did you ever take a regular course in medicine and practice medicine? A. No, sir; I attended a medical school, but I never graduated.

Q. Do you profess to be what is known as a medical physiologist? A. I never graduated from a medical school. I have a great deal of experience in physiological chemistry.

Q. You say you are a physiological chemist? A. Yes, sir.

Q. You say that you have been interested for a great many years in this question of baking powder? A. Yes, sir; my attention was called to it over thirty years ago.

Q. I suppose you have detailed all of the actual experiments that you have made, have you not? A. I do not understand the question.

Q. You have detailed in your direct examination all the actual experiments you have undertaken, have you not? A. Yes, sir; yes, sir.

Q. And such conclusions as you have drawn that are not from actual experiments you have drawn from your knowledge of the literature on the subject and are based rather upon your theoretical knowledge? A. Upon my general chemical and physiological knowledge.

Q. I suppose you call that theoretical don't you? A. No, sir; only in so far as the physiological is concerned. The chemical is not theoretical.

Q. You read Doctor E. E. Smith's testimony very carefully did you? A. Yes, sir; I have read it

Q. And you have given it a very great deal of study? A. Yes, I studied his testimony.

Q. I suppose that was done at the request of Major Cunningham and Doctor McMurtie? A. Well, I profess to know more about these matters than most people engaged in this line of work and a great deal of my work during the last four or five years has been in that direction and when I was called upon to testify in this case I heard that certain experiments had been made in New York and I was very anxious, yes extremely anxious to get the results of those experiments and Mr. Cunningham got for me a copy of the testimony covering those experiments.

Q. Major Cunningham got you a copy of the testimony detailing the result of those experiments? A. Yes, sir.

Q. You say that Major Cunningham was very anxious that you should see that testimony? A. It was I myself who was anxious to see the testimony.

Q. And you studied it with a view of criticizing it for the purpose of assisting the plaintiff in his case? A. He asked me to make such criticisms as I thought I would

I be justified in making regarding the experiments made by Doctor Smith.

Q. Now then Professor you speak of this diet of Doctor Smith as being a starvation diet. Do you assume the amount of food that was taken by Doctor Smith in the experiment on himself to be a starvation diet—did you make an estimate of the amount? A. Yes, I estimated it.

Q. Why do you say then it is a starvation diet? A. I will give you here my calculations that I may show you why I call it a starvation diet taken by Doctor Smith.

Q. Do you consider this diet taken by Dr. Smith, who testified that he was a professional man in middle life with the ordinary duties of a professional man who took in three days eighteen hundred grammes of bread, which I have calculated to be four pounds.

The Witness: If you will permit me to make a statement I think I can cover this matter better and in fewer words.

Q. Well, go on and make any statement you want. A. The experiments during the past three of four years that have been made by the most famous investigators in this country in reference to this question of diet and they have arrived at the conclusion as to the quantity of food material absolutely necessary to maintain the equilibrium of the body. I myself took part in these investigations. Now in regard to the protein matter, there should go into the body in a day just as much protein matter as is eliminated. Where more protein matter is eliminated during the twenty-four hours than is taken into the body it follows that it is eliminated at the expense of the body itself and it is important therefore that the equilibrium should be maintained and for that reason estimates have been made as to the actual amount of nitrogenous matter that should be in the food consumed in a day. That is why I say that in Dr. Smith's case his was a starvation diet. I found that in his food and in his urine, it is somewhere on page 18, he had eliminated 51.41 nitrogenous matter, whereas in his food he had taken four hundred and twenty-two grammes of nitrogenous matter, and I have made a calculation that that would be 47.18. Now, then, if he received into his body 46.23 of nitrogenous matter and

eliminated 51.41, he actually lost during that time 5.17, so that loss was at the expense of the body. In the last experiment, or second experiment, in a similar way, I find he lost 4.25, so that when one gramme of nitrogenous matter equals 28.17 grammes of food he must have lost during the first period about 145, which is equal to three-tenths of a pound, and in the second place he lost 119.7. So that during the time these experiments were made the food that he took was not sufficient to maintain the equilibrium and therefore he was eliminating more nitrogenous matter in the faeces and urine than he was taking in. Dr. Smith during this period took in (on page 16) 288.915 grammes of protein, that is during the three days and if you divide that you will find it is 96.3 per day. Now it has been estimated by Atwater that the least amount of protein matter that can be taken to maintain the equilibrium is 136.1 grammes in a day. Moleschott estimated it to be 131.5. Playfair in his experiments reported 186 grammes protein matter for man working at the hardest kind of work. Now the lowest estimate is that by Moleschott, which is 131½ grammes. As I have before stated, Dr. Smith took only 96.3 grammes for 24 hours, so that he took about 35 grammes less per day than the very lowest amount fixed by any of those eminent authorities. Now, as I have already stated, the income of nitrogenous matter for Dr. Smith was 46.23, the outgo was 51.4. In the second period the income of nitrogenous matter was 47.19. The outgo was 51.44.

Q. Now, having made that statement, professor, I will pursue my question. I have calculated the amount of food that Dr. Smith took in three days at 1,800 grammes of bread or four pounds. Two hundred grammes per meal makes eight ounces of bread per meal, which would be about eight or nine biscuit. Of meat he took 300 grammes or 1 4-4 ounces of meat per meal, which would make about two chops of the ordinary size. Of milk he took 1,500 grammes, or 6 3-4 ounces of milk per meal. Reducing the butter to grammes he had 2-3 of an ounce of butter per meal, now I will ask you whether that is a sufficient diet for a professional man in middle life of normal state of health? A. I would like to answer that question by making an explanation.

Q. I do not care for any explanation. You can answer

the question whether it is sufficient or not sufficient. After you have answered the question then you may make any explanation that you want to make regarding it, but I think you can answer that question yes or no, and then explain your answer afterwards. A. I cannot answer your question since I do not know the quantity of water contained in the milk, or meat or the bread. Unless I have some statement of the amount of water contained in those things I could not give you an answer to your question.

Q. If you will look at the bottom of page 16 he calculates the solids in the food he has taken. Have you made any caluculation from his statement, in grammes of the diet he took? A. I took the statement on page 16 near the bottom for one extreme and on the top of page 20 for the other extreme. I can make a further explanation if you want it.

Q. I am not asking for any further answer.

Mr. Cunningham: If you have any further answer to make please make such explanation as you think desirable.

A. The food that we take is for the purpose of enabling us to perform the work, the mental and physical work that the body is called upon to perform. We always measure that in calories or heat units and we can calculate the exact number of heat units that is contained in the food and in that way can give the total amount used during a given time. There must be an equilibrium, that is to say, the diet must be equal to a given number of heat units and I estimated that Dr. Smith, (at the bottom of page 16) in taking this diet took something over 2,100 calories when Professor Atwater estimates 3,081 heat units. Moleschott estimated them at 3,160 and Playfair at 3,750, so that in other words during this time Dr. Smith only took an amount equal to two-thirds of the lowest amount given by any of these investigators, so that he must have lost in flesh because he would eliminate, and in fact did eliminate a certain amount of nitrogenous matter in a day and he did not make it up by taking its equivalent into his body and therefore during that time he was wasting his own body.

Q. Do you claim that it makes no difference whatever a man's occupation may be or whatever the state of his

health may be—must always have the same diet? A. No, sir.

Q. It varies according to circumstances, then; does it not? A. Yes, sir.

Q. Now, professor, you criticize Dr. Smith for saying that there were aluminum compounds in almost all drinking water, and he said that he had analyzed a great many potable waters and found aluminum compounds in them and that he had analyzed others in which there was but a trace. Now do you say that it is not true that there are any aluminum compounds in ordinary water; potable water? A. There are more or less aluminum compounds in a soluble condition; yes.

Q. Now, you have described the analysis that you made of the Layton baking powder contained in the can marked complainant's exhibit No. 8 and that you obtained the following results: Grammes, 18.16——

Mr. Cunningham: What is it, grammes or per cent.?

Mr. Seddon: I think it is per cent.

Q. You gave the amount of alum as 18.16 per cent.; insoluble matter, .62; sodium bicarbonate, 19.38; phosphoric acid, .15; starch, 61.69. I will ask you from what source the trace of phosphoric acid was derived? A. From what?

Q. Yes, from what source did you get the fraction of a per cent. of phosphoric acid that you reported in your analysis? A. I got it from the baking powder.

Q. You got it as the result of the analysis from the baking powder? A. Yes, sir.

Q. Would it be possible to have come as the result of the analysis—that is of the result of the experiment. Isn't it possible that it came as the result of the experiment when as a matter of fact it did not exist in the baking powder at all? A. No, sir; I have done a great deal of work with phosphoric acid, because the state imposes upon me a great deal of that work in connection with my work in the university and I am satisfied that the phosphoric acid existed there or I would not have found it as a result of my experiment. There could have been no re-agent if that is what you mean?

Q. If you were told that no phosphoric acid was used in the manufacture of that baking powder would you still in-

sist that it was phosphoric acid? A. Why, I would still insist that it was, because I found it there.

Q. What test did you make for it. What agent did you use to get the phosphoric acid? A. I used a dilute solution of hydrochloric acid and filtered it off and then tested it with the molychute solution and then tested for hydrochloric acid. That was one process. I subsequently took a quantity of the baking powder and incinerated it with pure sodium bicarborate and fused the mass after which dilute nitric acid was added and I tested that with the molychute solution and I found the phosphoric acid and eliminated it in the proper way. The first solution did not yield it because of the organic matter present, but as the organic matter was gotten rid of by the incineration I found it when I made the second test.

Q. Why did you use hydrochloric acid—why didn't you use nitric acid? A. That was not necessary, because I only wanted to make a qualitative test. If I had found any present I would have made a quantitative test.

Q. How did you get it? A. I weighed five grammes of the baking powder and incinerated it with pure sodium bicarbonate, fused the mass, after which dilute nitric acid was added and then I tested it for phosphoric acid, after having filtered off any insoluble matter that might be contained and I ascertained, having taken five grammes that in a hundred grammes there would be twenty times the amount I had in the five grammes which would give me .15 of one per cent. phosphoric acid.

Q. You calculated from that small amount the amount that would be contained in 100 grammes? A. I took five grammes and having ascertained the amount of multiplied it by twenty, which would give me the amount in a hundred grammes, which I took as a unit.

Q. Can you give us the actual weight of the magnesium you thus found? A. Yes, sir. It is six milligrammes.

Q. From five grammes of the baking powder? A. Yes, sir.

Q. Six milligrames? A. Yes, sir: of magnesium phosphate, Mg-2, P-2, O-7.

Q. In this individual instance? Yes, sir.

Q. Now, if it is true, as has been stated here, that there was, as a matter of fact, no phosphoric acid used in the

manufacture of this material, how do you account for its presence as the result of your analysis? A. Because it was there. I found it.

Q. My question is how do you account for it? A. I cannot account for it, I was merely endeavoring to find that there was any and having found it I determined the amount.

Q. What is the proportion between the bicarbonate of soda and the soda alum necessary to a complete reaction? A. I can figure that out for you.

Q. Isn't the proper proportion fifty to forty-eight? A. Fifty to forty-eight?

Q. Isn't that the proper proportion known among chemists? A. I think the molecular weight of the alum is 484. Now, then, I have made the calculation and I ascertained the proportion to be 484 to 504.

Q. I believe that is right. I think Dr. Keiser stated it that way, but then exprssed it in smaller numbers, as 50 is to 48. Now in this analysis I see you get 61.69 per cent. of starch. What effect, if any, has the starch in the baking powder? A. It tends to preserve it in the market.

Q. As I understand it, professor, it seems to be necessary to add something to keep the active agents apart because they have great affinity one for the other and for that reason starch is put in; is that it? A. Starch up to a certain amount is necessary to preserve the baking powder because if there is any moisture a partial reaction will take place and cause the powder to deteriorate.

Q. These elements have great affinity for each other, have they not? A. When there is any moisture present. They never combine when perfectly dry.

Q. I suppose the starch is put in there as a filler for the purpose of keeping them dry and preventing any reaction? A. Yes, sir.

Q. You say they would not combine unless there was moisture? A. No, sir; they would not.

Q. You say only a certain amount of starch is necessary and more than that would be diluting it? A. Yes, sir.

Q. But you say they have great affinity for each other? A. They will unite in the presence of moisture. The sulphuric acid in the alum acts like free acid.

Q. Now, going on with the analysis, I find you report 19.38 bicarbonate of soda, 18.16 alum, which makes a slight excess of bicarbonate of soda, that is to say there is a little more soda than is necessary to react with that quantity of sodium alum? A. No, the sulphate of soda in the alum is not quite sufficient to give that quantity the proper reaction. They really call by courtesy the combination alum.

Q. What would you define alum to be? A. Alum I would define to be a compound with a molecular weight calculated at 484. That is alum chemically speaking. That is alum in the proper sense of the word. Alum as it exists in nature contains a great deal of water, and when this water is volatilized in whole or in part, chemists yet call the residue alum. There may be a little less or a little more sodium sulphate present than the combination requires, yet, notwithstanding that the chemists as a rule by courtesy call it alum.

Q. By courtesy? A. Yes, sir.

Q. Is it not in truth and in fact alum? A. It is called alum.

Q. I do not quite understand you. A. Let me take for example, by way of explanation this ornamental post here (indicating); now that is carved to represent a pine apple and we would refer to it as the pine-apple ornament. Should we chip off the outside and destroy its real form of a pine apple we would still refer to it as the pine apple ornament. In the same way alum as it exists in nature containing a great deal of water, the water may be volitalized in whole or in part and there may be more sodium sulphate than is necessary for the combination, yet chemists still speak of it as alum.

Q. I think you criticized Professor Keiser's estimate of the amount of hydrate of aluminum there on the ground that he did not check his work and that he did not make two analyses. What is your authority for saying that he did not make two or more analyses. Did he do anything more than report his conclusions as to what he found? A. When a chemist discovers what appears to be an unusual thing he should feel called upon to make not only duplicate experiments, but many determinations to avoid possible errors before his brother chemists will accept his work as an accomplished fact.

Q. What authority have you for saying that he should have made repeated experiments. Do you know as a matter of fact that he did not make repeated experiments? A. I have been an analytical chemist for twenty years or more and my experience with young men, not much older than Professor Keiser, has been that they are inclined to shun the labor of the laboratory and that they would rather give their results and avoid the labor of repeated determinations, hoping that these results would prove correct or that the matter might not be inquired into, too closely.

Q. I think you do Dr. Keiser too much justice on this record Professor. I think his age is much beyond what you have given him credit for. It seems to me that a man who has grown so bald-headed is no longer to be classed among the young men. A. Well, I know that every man is liable to mistakes. I have made mistakes myself. The only man who makes no mistakes is the man who does no work. The only persons who make mistakes are those who do work and as we are all human we must make mistakes. I felt called upon to criticize Professor Keiser's testimony because I felt he was making a grave error when he claims to have discovered, I believe 9 grains of aluminum hydrate in a loaf of bread which was cooked with straight alum baking powder.

Q. What particular criticism have you to make of that? A. Why, Professor Keiser reports about two grains more of aluminum hydrate in the bread than could come from that amount of baking powder. Now this is a very small amount, but I think under the circumstances, Professor Keiser should not only have made one experiment, but repeated the experiments and only have made his report after a half dozen at least.

Q. You do not know how often he repeated his experiments do you? A. Not from anything he says there.

Q. The only thing is that you think he should have done so? A. Yes, sir; he should have repeated his experiments.

Q. Then the criticism fails if as a matter of fact he did make repeated experiments and obtain that result? A. If the experiments were numerous enough to ascertain that beyond any doubt.

Q. And you base your criticism in that regard solely on that point? A. Yes, sir.

Q. When did you make your experiments with reference to the bread you have described? A. I baked my first batch of biscuit on January 15th with this baking powder.

Q. Well, go on. A. On January 20th I made another batch of biscuit with Layton baking powder, and on January 26th another, and last Saturday, which made three batches of biscuit. I only baked three batches, using eight ounces of flour each time, and I used for this purpose a moderate teaspoonful of baking powder.

Q. Did you do the baking yourself? A. I mixed it and I saw the colored woman use a spoon to get the dough in proper shape for the biscuit and put it in the oven.

Q. What I want to know is that you yourself put in the different ingredients? A. Yes, I made additional biscuits besides those, but they do not cut any figure here.

Q. Did you make any experiments to ascertain whether there was any free alum? A. Yes, sir; I tested some of the bread to see whether or not there was free alum.

Q. Did you find any? A. Yes, sir.

Q. How did you make that test? A. I used a tincture of log wood.

Q. Don't you know, professor, as a matter of fact, that the use of tincture of log wood has long been abandoned as being unreliable? A. Yes, sir; under certain circumstances.

Q. How do you mean? A. There was no acid that could combine with it and therefore under the circumstances there was no objection to using it.

Q. How do you mean? A. The chances are that the soda being present would neutralize any acid.

Q. Have you any doubt as to the accuracy of your results? A. No, sir; none in the world.

Q. You would stake your professional reputation on the results? A. Yes, sir.

Q. And you say that there is no doubt that the precipitation was aluminum? A. There is no doubt about that.

Q. How do you know that the precipitate was aluminum? A. There can be no doubt about that in the world. I tested it and found it to be so.

Q. Are you sure that it might not be some other substance? A. Now, if you ask me that it might be some

other substance I would say that it might, but what other substance—it looks like it, and I have no doubt in my mind but what it was. The chances are very much in favor of that position.

Q. You have no doubt of it? A. This substance I refer to as being hydrate of aluminum (producing a small bottle) was obtained from 122½ grains of this baking powder.

Mr. Cunningham: Let the record show that the bottle the witness refers to is marked plaintiff's exhibit No. 9 on the cork.

Q. I wish you would state what is on the label in order that we may further identify it. A. I made an experiment similar to this——

Q. Please state what words are written on the label there. A. Aluminum from 122 grains of baking powder.

Mr. Seddon: That is aluminum, not aluminum hydrate? A. Yes, sir.

Q. Referring to this bottle which counsel has marked plaintiff's exhibit No. 9, you say that contains hydrate of aluminum? A. That contains aluminum.

Q. Hydrate of aluminum and hydroxide of alumina are the same, are they not? A. They are often called that ay.

Q. Now, speaking of this hydroxide of aluminum, I notice there seems to be much less in the bottle than there was before? A. Yes, sir; when I first put it in there the bottle was nearly full. You will find that it will keep shrinking that way and if you take it out and allow it to dry it will become smaller and smaller.

Q. It will continue shrinking until if allowed to dry it will become a small quantity like in one of these bottles (indicating)? A. I wish to say I did not make these experiments for the purpose of criticizing Dr. Keiser. That was not my object at all.

Q. Fresenius is considered authority on analytical chemistry, is he not? A. Yes, sir.

Q. A well recognized authority? A.. Yes, sir. I accept everything he says.

Q. I will call your attention to this paragraph, but before doing so I will allow you to read it to yourself and then

I want to know what you think about it (handing witness a book)? A. I am perfectly familiar with that. I know all about that.

Q. Doesn't he say in substance that the aluminum hydrate when but recently precipitated will dissolve very readily in the hydrochloric and nitric acid, but if filtered off and allowed to remain some time after it has been filtered it does not dissolve in any of these acids until after a considerable length of time and when allowed to dry it will shrink until it presents the appearance of a hard translucent yellowish earthy mass? A. Yes, sir; you have stated about what he says here.

Q. Now, then, you have referred to that mass in the bottle as shrinking and you say that if allowed to dry it will finally become very small in quantity? A. Yes, sir.

Q. Professor Mallet of the University of Virginia testified that the temperature of the interior of a loaf of bread was 212 degrees during the process of baking, now would not that temperature have a great tendency to reduce the volume of the hydrate of aluminum? A. Not to any very great extent, because you must take into consideration the fact that the interior of the loaf of bread is very moist. In fact it has been found to contain between thirty-five and fifty per cent. of water and as long as that water was present its bulk would not shrink so much because it would have no chance to dry.

Q. Now would it not, under a heat of 212 degrees shrink in volume until it would be no greater in quantity than the quantity in one of these small bottles? A. If given an opportunity to dry it might, but not in the bread because of the moisture present.

Q. That would be the natural tendency, though? A. Yes, sir.

Q. As I understand you when you first precipitated that aluminum hydrate it filled the bottle? A. Yes, sir; and you will find that it will gradually shrink in bulk that way, and if the water was removed and it was allowed to dry it would shrink still more.

Q. How is that? A. I say that it would be impossible to still further reduce the volume if it was freed from the water and allowed to dry.

Q. When it was precipitated the amount was much larger than it is now? Yes, sir.

Q. And as I understand it, after it has been allowed to stand some time it does not dissolve so readily in the acid? A. Not after being allowed to stand.

Q. Now, then, Professor Fehling is authority on analytical chemistry, is he not? A. Yes, sir; I don't think that will be disputed.

Q. Do you read German? A. Yes, sir.

Q. Will you kindly read down to the word "powder?" A. Yes, sir; shall I translate it for you?

Q. First state so the record will show it, what you are reading from. A. The book is entitled "Handworterbuch Der Chemie, Fehling," meaning handbook of chemistry by Fehling.

Q. Now please read down to that clause. A. "A fresh precipitate of hydrate of aluminum is colorless, glutinous and transparent and becomes on drying a horny transparent mass and falls to powder.

Q. Now, is it not a fact that the first mass or bulk when first precipitated is quite large in quantity and then as it dries it becomes less and less until it occupies a very small bulk? A. Yes, sir.

Q. Will you please tell me why that is so? A. I cannot account for the conduct of these substances on drying.

Q. You speak of the medicinal properties of alum. You have made no experiments have you for the purpose of ascertaining its medicinal qualities and what you have stated here as I understand it is entirely theoretical? A. No, I have made no experiments myself in that direction.

Q. Do you know of anyone else who has made any experiments outside of Dr. Flint and Dr. Smith? A. No, sir; I do not.

Q. When you speak of its medical and therapeutic properties I suppose you refer to its administration in the form of pure alum? A. That is it may contain a little more sodium sulphate than is necessary for the compound, yet it is what the chemists call alum nevertheless.

Q. I am speaking of its medical properties. I suppose you refer to its administration as pure alum? A. Yes, sir.

Q. You have never administered yourself, have you? A. No, sir.

Q. You refer to the administration of pure crystalized alum? A. Pure crystalized alum or dry alum, not burnt alum.

Q. Are the doctors agreed as to what effect it has upon the digestion? A. You mean what effect is has upon the human organism?

Q. Well, take it any way you like. A. Only from speaking with those doctors with whom I come in contact. I never gave it in doses directly for the purpose of determining what effect it would have on the health.

Q. And what you know of the experiments is what you learned from others? A. Yes, sir.

Q. You speak about the effect that it would have upon the gastric glands? A. I gave that on medical authority.

Q. Were you referring to the dose as to whether it was large or small when you considered what effect it would have? A. How do you mean?

Q. You were expressing an opinion that alum would have an effect in that way. I want to know whether you yourself knew whether they were small doses or whether the effects were produced by large doses? A. The effects I refer to were produced by large doses.

Q. Isn't it a thing well known among reputable authorities that very frequently small doses of a substance will have a very beneficial effect while on the other hand large doses will be found to be very injurious? A. Small doses will often result in a benefit when large doses would prove injurious.

Q. So it is a fact that small doses may be given without injury? A. Yes, sir.

Q. Isn't alum one of those substances that may be given in small doses without injury? A. I do not think it could be given in long repeated doses without injury. A few doses might not work any injury and perhaps would not.

Q. Isn't it true, doctor, that in large doses a medicine may have a very powerful effect while in small doses it would not have any appreciable effect? A. That is very true.

Q. So that there is a great difference between administering a substance in large doses and administering it in a small quantity? A. Yes, sir.

Q. Are you willing to say that alum is absorbed into the system at all through the stomach? A. Well, I would be inclined to say yes.

Q. Would you dispute the authority of Dr. Vaughn, who testified here on Saturday that in all of his investigations he would not say that it was absorbed into the system? A. I did not hear his testimony, but I know that experiments have been made by doctors, and in the last few years they begin to express the opinion that alum is absorbed.

Q. You did not hear Dr. Vaughn's testimony? A. No, sir; I don't know anything about it.

Q. You are not prepared to say that it is the unanimous opinion of all reputable medical authorities that the presence of alum in the bread is necessarily injurious to the human stomach, are you? A. All of the doctors with whom I have talked or with whom I have come into contact take the position that it is injurious.

Q. What do you mean by the doctors with whom you come in contact? A. The medical men in the profession.

Q. You do not speak of eminent scientists? A. No, sir.

Q. You mean the average practitioner? A. Yes, sir.

Q. I believe you referred this morning to Blythe? A. Yes, sir.

Q. He is an authority, is he not? A. Yes, sir; a most reputable authority. I accept his authority.

Q. He is a generally accepted authority, is he not? A. Yes,sir.

Q. Now, I ask you what you have to say to this statement of his "I am therefore decidedly of the opinion that alum in food in reasonable quantities is not injurious to health?" A. How is that?

Q. "I am therefore decidedly of the opinion that alum in food in reasonable quantities is not injurious to health." What have you to say to that statement, professor? A. I accept that statement.

Q. You do accept that statement, do you? A. Yes, sir.

Q. You say that is true? A. I accept the statement, but I would like to read you another statement from Blythe.

"It will be found that generally the medical profession believe that alum even in small doses acts injuriously on the human animal organism." That is the statement that I wanted to read to you from Mr. Blythe.

Q. But I want you to read the whole statement. There is no doubt that he makes the statement that you have just read. Go on and read what he says there. A. Where do you mean?

Q. I want you to read his other statements on that same page. If not on the same page they are at least right near where you are reading. You have only read a very small portion of what he really states there, and it is manifestly unjust to have the record show the statement that you have just read as coming from so eminent authority as Blythe without you read what follows. If you object to reading it I will read it myself, and then you can answer whether or not it appears in the book. "It has been also satisfactorily established by Seim that if animals are treated by a sub-cutaneaceous dose of aluminium salts a peculiar nervous condition may be produced similar to the disease known as bulbar paralysis. On the other hand, it is a question whether, in the moderate doses in which alum is taken, in food, or bread cooked from flour which has been mixed with alum baking powder, has the slightest appreciable influence on the health. The writer and the writer's family have used alum baking powder for years without injury. The fact that tons of alum baking powder are sold every week must show that a vast number of persons use alum baking powder and yet no special malady has been recorded." So that he does qualify the statement you first read. A. I have read you the statement just as it appears. Shall I read any more?

Q. No, let it go; you read the part that I wanted. You have very carefully considered the testimony of Dr. Keiser, you say? A. Yes, sir. I haven't got the paper.

Q. Does sugar occur in flour? A. That is a mooted question. Many investigators have reported sugar in flour and others have reported that it was not in the original but it developed in the attempt to analyze it.

Q. What do you say? A. I don't feel called on to decide that question.

Q. I am speaking of crystals of sugar—cane sugar—I mean sugar in the crystal form. Is it a natural constituent

of the flour? A. I say that cannot be determined only by chemical analysis, and it is a question, as I stated before, whether it existed in the flour or as a result in making the flour.

Q. I mean grape sugar. A. I cannot say. I do not like to decide that question.

Q. As a matter of fact, can it not be found there in very minute quantities? A. It has been reported occasionally; I have some doubt about it though.

Q. In a solution it will require the presence of a very large amount of sugar to prevent the precipitation of the aluminum would it not? A. You ask whether it would prevent the precipitation. How do you mean, a large quantity or how?

Q. I say it would take a large quantity of sugar to prevent the precipitation of the aluminum. A. I never made any experiments off hand; I would say that an equal amount in weight of sugar with the aluminum would interfere with its precipitation.

Q. You say you have never made any experiments along that line? A. No, sir; I only know that it is difficult to precipitate aluminum in the presence of organic matter, and, of course, sugar is along with the rest of that class.

Q. You say that a dialyzing membrane will hold back the aluminum? A. It will hold back any inorganic substance that crystalizes where the crystals are larger than the pores in the membrane. If the crystals are larger than the pores in the membrane they will pass through.

Q. Have you any reason to believe that sugar exists in the flour in the form of white crystals? A. I have stated I did not like to decide that question. My personal opinion is that no sugar exists in the flour.

Q. Where are those small bottles containing samples of the precipitate you get from the solution of hydrochloric acid? A. Here they are. The one containing the smallest quantity most likely contains the most aluminum.

Q. They all seem to be alike, professor. Are they supposed to contain the same material? A. This one (indicating) contains crystals of sodium sulphate, Glauber's Salts. After it had partly crystalized, I poured off the solution into the watch glass and finally I obtained this small amount.

The one which contains the smallest quantity, I believe, contains the most aluminum.

Q. What do you say as to this one (indicating)? A. This in the small bottle here, certainly has the most alum; it has a very decided taste.

Q. Can that be determined by the taste? A. It has a peculiar taste, peculiar to itself, and it can be recognized very readily that way.

Q. Isn't alum less soluble than sodium sulphate? A. I cannot tell.

Q. The sodium sulphate was present to a much larger extent than the alum? A. Yes, sir.

Q. If the alum crystalized out should that not have crystalized out also? A. No, sir, not necessarily; that would depend upon the temperature of the room—would depend upon the quantity and other considerations. I tried to get pure crystals of alum, but I failed to do so. I do not think anybody could have done so.

Q. That is the very point. You do not think you could get pure alum? A. No, sir.

Q. And when you got this and you found it had astringent taste, you called it alum. A. I know it was alum, that is to say, the purest I could get.

Q. Has aluminum chloride the same taste? A. Not in the condition in the gelatin alum.

Q. Do all soluble aluminum salts taste alike? A. Yes, sir; very much alike.

Q. You had a chloride, had you not? A. Yes, sir.

Q. How would that taste? A. Very similar.

Q. This bottle contains salts, does it not? A. Yes, sir.

Q. Some made by hydrochloric acid? A. Yes, sir.

Q. But you would not say, would you, that you got any pure alum? A. I do not say that any of that is pure alum. I tried to get it, that is the best I could do.

Q. This is not pure alum—that is my question? A. No, sir.

L. R. HARRIS, a witness of lawful age, being called and sworn, testified on the part of the State in rebuttal, as follows:

Direct Examination.

By Mr. Cunningham:

Q. State your full name. A. L. R. Harris.

Q. Where do you reside? A. In the city of St. Louis.

Q. What is your business? A. I am a city salesman for Ford & Doan.

Q. Please look at the tin can which is marked here "Exhibit A," being also marked with the initials "L. R. H., Jan. 17th, 1900," and state whether or not you ever saw that can of baking powder before, and if so, when and where and under what circumstances. A. I bought that can of baking powder at a store between 19th and 20th street, on Olive street on the 17th day of January, 1900, and put thereon my initials and the date as you see it there.

Q. What sort of a place was that where you bought it? A. It was a regular grocery store.

Q. Did they have it regularly for sale? A. Yes, sir; I bought several lots there.

Q. Do you know whether or not that can was sent to Professor Schweitzer? A. No, I don't know anything about that.

Q. What did you do with it? A. I turned it over to Ford & Doan.

Q. Do you know of your own knowledge, what they did with it? A. No, sir; I do not.

Mr. Cunningham: I understood that this witness could testify to the fact that that can was sent to Professor Schweitzer, that being the case, I will have to get one of the firm who knows what was done with the can.

Mr. Seddon: I don't think there is the slightest doubt but that is the same can that was sent to Professor Schweitzer.

The Court: Will it be admitted for the purposes of this case, that that is the same can that was sent to Professor Schweitzer?

Mr. Seddon: I will admit that that is the same can that was sent to Professor Schweitzer.

Mr. Cunningham: I will state that it is a fact that it was sent to Professor Schweitzer.

Q. I now show you a can marked Complainant's Exhibit No. 10, together with the letter of Ford & Doan, which was received at my office, and will ask you if you recognize that can, and if, so state where and when and under what circumstances you saw it. A. I cannot say that I purchased that can, but I did purchase some on the 2d of January the date marked on it and delivered them to Ford & Doan.

Mr. Seddon: Are you satisfied that was purchased in the regular market?

Mr. Cunningham: There is no doubt about that.

Mr. Seddon: Then let it go in, I will accept your statement for it.

Mr. Cunningham: I will state that it was sent to my office and from there to the office of Prof. Potter.

Mr. Seddon: Schweitzer or Potter.

Mr. Cunningham: This particular can was sent to Prof. Potter.

Cross-Examination.

By Mr. Seddon:

Q. You say you are city salesman for Ford & Doan. A. Yes, sir.

Q. They are a grocery house, are they not? A. No, sir; they are brokers.

Q. By that you mean brokers in connection with the grocery business? A. Yes, sir.

Q. They are the agents of the Royal Baking Powder Company, are they not? A. Yes, I think so.

Q. And you are one of the salesmen of the Royal Baking Powder Company? A. No, sir; I am not a salesman for the Royal Baking Powder Company.

Q. You are employed by Ford & Doan? A. Yes, sir.

Q. And you handle the Royal Baking Powder Company's goods in the regular course of your business? A. Yes, sir.

Q. Where did you buy that can of baking powder, or rather those cans of baking powder? A. I bought from Behey Bros. Up on Olive street.

Q. Were they selected or just picked out of the stock? A. They were taken from the regular stock. They kept it for sale.

PROFESSOR WILLIAM B. POTTER, a witness of lawful age, being called and sworn, testified on the part of the plaintiff as follows:

Direct Examination.

By Mr. Cunningham:

Q. State your full name. A. William B. Potter.

Q. You are a resident of the city of St. Louis, I believe? A. Yes, sir.

Q. In what business are you engaged, professor? A. I am the proprietor and manager of the St. Louis Sampling and Testing Works.

Q. Of what schools, colleges or institutions of learning are you a graduate? A. I am a graduate of Columbia college—Columbia university it is now, of the collegiate department, in 1866, and the School of Mines in 1869.

Q. What degrees, if any, have been conferred upon you by institutions of learning and science? A. I received the degree of A. B. on graduating in 1866 at Columbia college. The degree of A. M. three years later and the degree of E. M. (Engineer of Mining) at the same time.

Q. From Columbia college? A. Yes, sir.

Q. What has been your work in the line of your professsion, and what offices and positions have you held? A. I have, since graduating, been most of my time in this city

in connection with the Washington university as professor of Mines and Metallurgy, beginning in the year 1871 and resigning in 1893, my work with that institution covering a period of twenty-two years. During the greater part of that time I had my own private laboratory for general analytical work. In 1888 I founded or started the St. Louis Sampling and Testing works, which were established for making investigations of all kind, chemical, physical and metallurgical.

Q. Has your work been directed at all to the subject of foods and the adulterations of food, and if so, state in what way and to what extent? A. To some extent during the last twenty years I have made more or less examinations of foods and have paid more or less attention to the subject of foods and their adulteration.

Q. Has your attention ever been directed to the subject of alum in the preparation of foods, and if so, state to what extent and how long ago you first began to consider the matter? A. I made some investigations for the purpose of determining the presence of alum in baking powder—that is all the work I have done on baking powders for that purpose previous to the work preparatory of this case.

Q. Have you kept yourself posted upon the scientific literature of standard authors on that subject and upon articles and treatises published by scientific men? A. Yes, sir; in a general way.

Q. What, if any, researches or experiments have you made to determine the consequences that will follow the use of alum in the preparation of human food. If you have made any such researches or experiments please include your determinations in your answer. A. The determinations which I have made were the result of tests made in preparation for this case. I obtained a sample of Layton's baking powder——

Q. Is this the can? (Showing witness a can.) A. Yes, sir. My initials are on that can, first month, second day, 1900. The can is marked plaintiff's exhibit No. 10.

Q. Now go on and state what determinations you made? A. I made an analysis of the contents of that can for the purpose of determining the carbonic acid, total and available, the aluminum, sulphuric acid, soda, phosphoric acid, starch, and water by difference.

Q. Will you please state the results of your determination? A. I found total carbonic acid 6.95 per cent.

Mr. Seddon: Six and what? A. Total carbonic acid 6.91 per cent.

Q. Is that carbon dioxide? A. Yes, sir. Going on with my answer to Major Cunningham's question, I found 6.95 per cent. carbon dioxide, being the total and six per cent. available carbonic acid.

The Court: Do you mean carbon dioxide? A. Carbonic acid and carbon dioxide is the same thing.

Mr. Cunningham: Proceed with your explanation. A. I found—

Aluminum	4.02
Sulphuric acid	12.
Soda	10.23
Phosphoric acid	a trace
Starch	48.89
Water, (by difference)	17.91
Total	100.

These I found to be combined as follows: Anhydrous alum, consisting of

Sodium sulphate	2.63
Aluminum sulphate	7.77
Total anhydrous	10.40

Aluminum hydrate	2.6
Sodium sulphate, also the result of reaction	9.01

The two representing 11.71, the product of the reaction already taken place.

The powder had already deteriorated in the can, or before I got it, and reaction had partly taken place. I found sodium bicarbonate, 1327, of which 11.45 per cent. were

available after reaction, with the remaining alum and 1.82 per cent. sodium bicarbonate in excess. Soda in excess .23 of one per cent.

The soda in excess showed that the sodium bicarbonate was not all bicarbonate, but was part soda. Soda was there as a normal carbonate. Calculating the soda bicarbonate it leaves an excess to that extent, that is .23 of one per cent.

Starch	48.89
Water by difference	15.6
Total	100.00

Q. Please tell us of any other determinations or tests you made with baking powder. A. I took a sample of this Layton baking powder and tried it with water for the purpose of bringing about a reaction. I then tied it in a cotton cloth made into a bag and inserted it in the dough of a loaf of bread, the dough being made in the usual manner, which was afterwards baked in the oven. This was done simply for the purpose of baking the powder under the some conditions that it would be after being subject to the heat of the oven in the baking of an ordinary loaf of bread.

I then determined the temperature in baking and found that the temperature of the oven was 452 Fahrenheit, and that the temperature of the interior of the loaf of bread was 208 degrees Fahrenheit. I made other determinations upon other loaves of bread at various times with the following results: I found in one case 205 degrees, another case 209 degrees, another case 210 degrees, another case 209 degrees.

Q. Fahrenheit? A. Yes, sir; this shows that the temperature of the interior of the loaf does not get above 212 degrees Fahrenheit while the baking is in progress. Then the aluminum was determined in the inoysted bag sample and found to be 3.2 of aluminum. One gramme of this inoysted sample of the baking powder was treated for two and a half hours at 100 degrees Fahrenheit in .25 of one per cent. solution of hydrochloric acid.

Q. Why did you take that particular strength of hydrochloric acid? A. Because that amount of hydrochloric

acid is contained in the gastric juice of the stomach. The amount of the aluminum found in the solution was two per cent. that is to say 62½ per cent. of the amount of the aluminum in the baking powder after going through the baking process in the loaf.

Q. Then to emphasize what you say, as I understand you, 62½ per cent. was found you say? A. Yes, sir.

Q. That is to say, you found that amount after the aluminum had gone through the process of baking in the loaf? A. Yes, sir.

Q. In other words when it was treated as the baking powder would be treated in making an ordinary loaf of bread? A. Yes, sir.

Q. And you found it to dissolve in that strength of acid? A. Yes, sir.

Q. You mean the aluminum hydroxide?

The Court: Does this occur in the form of an aluminum hydroxide? A. The aluminum occurs in the form of aluminum hydroxide in the baking powder, after baking.

The Court: In this instance to which you refer did it occur in that form? A. It occurred in that form, yes sir. I stated that as aluminum. That is simply another way of comparing the proportion dissolved with the original amount. Sixty-two per cent. aluminum corresponds to about three per cent. hydroxide. In the same way the aluminum was stated as being present in the original sample.

Q. Now I will ask you Professor, if I interpret rightly what you state please answer my question yes or no. You found 2 grammes of alumina present in the solution, is that right? A. Two per cent. yes sir.

Q. You put in three grammes did you? A. No I put in one gramme.

Q. Now what did the two per cent. you spoke of represent? A. That is the alumina that is contained in the solution. I had three and two-tenths per cent. of alumina in the original sample. I obtained two per cent in the solution, that is 62½ per cent. of the total alumina in the incysted sample went into the solution.

Q. So that the aluminum hydroxide as a result of the baking is soluble to the extent of 62½ per cent? A. Yes, sir.

Q. Now then go on? A. Another test was made upon a loaf of bread made with the Layton powder and then digested and some of this was put in a .25 per cent. solution of hydrochloric acid and kept at a temperature of one hundred degrees Fahrenheit. As a result I obtained .5 of one per cent of alumina.

Mr. Seddon: How much? A. Five one hundredths of one per cent.

The Court: Five parts in one thousand? A. Yes, sir.

Mr. Cunningham: Please go on. A. I digested a portion of the bread in cold water for twelve hours and then tested and found a trace of aluminum in the aqueous solution showing that a part of the aluminum hydrate is soluble in water in the bread.

Q. That is the aluminum hydrate in the bread? A. Yes, sir.

Q. State if you made any other tests and what they were? A. Another test was made with a twenty-five one hundredths per cent. solution of hydrochloric acid and a solution of the digested bread and in fact I made two of these solutions. In one solution I destroyed the organic matter and in the other solution the organic matter was allowed to remain. I then found in the solution in which the organic matter had not been destroyed, upon a reaction for aluminum none was precipitated. In the other solution after destroying the organic and precipitating the aluminum I succeeded in doing so showing very clearly that where the organic matter was still present in the aqueous extract of the bread it prevented the precipitation of the aluminum hydrate and where there was no organic matter in the aqueous extract the aluminum hydrate was readily precipitated.

The Court: You use the term "digested" do you mean by that stomachic digestion or do you mean dissolving it

thoroughly? A. I mean heating it mildly in a solution in a beaker and letting it stand sometime and shaking it about frequently.

Q. The term is not strictly speaking digestion then. It would be more like dissolving it would it not? A. The term "digestion" is used in that way in chemical parlance, and I went through that operation for the purpose of getting into solution whatever was soluble in the bread.

Q. Then it has no reference to digestion in the stomach at all? A. No, sir; that is merely an expression which chemists use for that process.

Mr. Cunningham: Professor, what if any conclusion have you reached as to whether or not the use of alum in the preparation of food for mankind is wholesome and harmless or otherwise? A. I am of the opinion and have been as the result of many tests and much investigation on this subject, that the use of alum in baking powders which are used for the purpose of making bread for human food is unwholesome because it permits the alum in a soluble form, or rather the combined parts to go into the stomach in a soluble form, that is to say, hydrate of aluminum which is left after the chemical reaction takes place between the alum and the bicarbonate of soda is to a large extent soluble in the gastric juices of the stomach and therefore it must have more or less effect upon the digestion.

Q. Is that effect beneficial or otherwise? A. It is otherwise.

Q. That is to say it retards digestion? A. Yes, sir; and produces other results; but, as I am not a physiologist I do not pretend to say what all of those results would be for of course I cannot tell just what would take place in the stomach.

Q. State whether or not there is a uniform consensus of opinion among medical men and men of science as to the effect of the use of alum in the preparation of food, being wholesome and harmless or otherwise? A. There is no consensus of opinion on that subject.

Q. On which side of that question is the weight of authority among men of science and medical men? A. As far as I am informed it is largely against the use of alum in

the preparation of human food as it is not considered harmless.

Q. That is to say the weight of authority is that alum is not a proper thing to use in the preparation of human food? A. No, sir; it is not.

Q. The question is the weight of authority is in favor of that proposition? A. Yes, the weight of authority is against its use.

Q. Have you read or did you hear the testimony of Doctor Keiser in this case? A. Yes, sir.

Q. What, if any, criticisms have you make upon the methods Doctor Keiser employed in making his experiments and the conclusions he reaches as the result of those experiments? A. I find in the first place some small inaccuracies in the figures. His analysis gives sodium bicarbonate 20.02. Sodium alum 20.04. Starch and insoluble matter 59.58. This is stated as adding up 100. I find that it adds up 99.64 per cent. There is a slight error I think in the amount of sodium bicarbonate. That is stated as 20.04, or rather should be 20.04, rather than 20.02.

There seems to be some grave errors on page 128, for instance, where he refers to the determination of sodium sulphate where he states that sodium sulphate is precipitated by barium chloride.

Q. What have you to say about that? A. Well, that is not true. Barium chloride cannot precipitate sodium sulphate. I mention that matter because it may be an error of the stenographer. On page 151 there is a statement of his method of determining the amount of sodium oxide.

Q. What is that statement to which you refer? A. He says here "I first took a quantity of the baking powder, weighed it carefully on an analytical balance, as before, after which it was placed on a platinum dish, properly muffled and the starch burned off. A white ash was left which was dissolved in dilute hydrochloric acid and then filtered, after which we have in the solution oxide of sodium, oxide of aluminum, sulphuric acid and hydrochloric acid. I then added chloride of barium to carry down the sulphide (it should be the sulphate) of aluminum and the alumina and then we have nothing left but the sodium and the sodium chloride in the solution that remains. In order to remove

any chloride of barium that might remain a stream of carbon dioxide was passed through after which the solution was filtered and the filter carefully dried and after having been thoroughly washed and ignited the weight of the sodium oxide was thus obtained."

It is difficult to see why the carbonic acid was introduced as it certainly would not remove the barium chloride. On pages 156 and 157 Doctor Keiser states that he made an absolute determination by inversion and therefore he must have had the insoluble matter in his results, as these two items are reported together. If you add these together it leaves thirty-six one hundredths of one per cent. of water which is certainly far too small where that amount of starch is present. On page 154 the sodium bicarbonate is considered as pure sodium bicarbonate, that is, not as having any soda in it, but pure sodium bicarbonate. As a matter of fact sodium bicarbonate contains more or less soda as I found in the Layton baking powder which I analyzed. These are all the criticisms that I have to make just now.

Q. What would you say as to the raising power or efficiency of the baking powder you examined in the first place which gave you a total available carbon dioxide amounting to six per cent. and the other sample which you found to contain, or rather which yielded you about 12 per cent. carbon dioxide? A. The baking powder containing only six and a fraction per cent. carbon dioxide—I believe it was six per cent. even available—would have only one-half the leavening power that would be contained in the baking powder containing twelve per cent.

Q. What in your opinion would be the probable effect of using that inferior baking powder such as you analyzed? A. A person making bread with this inferior baking powder would find that the bread was not properly leavened when they used only two heaping teaspoonfuls and therefore their experience would teach them to use a greater quantity. The chances are that they would soon learn to use double the quantity.

Q. Now, Professor, have you heard, or rather did you read the deposition of Doctor E. E. Smith and Doctor Austin Flint given in this case in New York? A. Yes, sir; I have read those depositions.

Q. What criticisms, if any, have you to make upon the methods, experiments and conclusions of Doctor Smith?

At this stage of the examination an adjournment was taken to 10 o'clock, February 13, 1900.

On February 13, 1900, the Court met and the hearing of the case was resumed.

WILLIAM B. POTTER, further testifies as follows.

Direct Examination.

By Mr. Cunningham: Prof. Potter, in your examination yesterday I may have asked you whether or not you had read or heard read the depositions of Dr. Ernest E. Smith and Dr. Austin Flint given in this case? A. I have.

Q. What, if any, criticisms have you to make upon the method of their experiments and the conclusion they have reached from those experiments?

The Court: If I remember correctly he gave that exposition.

The Witness: That question was asked but not answered.

Mr. Seddon: The record shows it was asked but not answered.

The Court: Proceed.

The Witness: In the first place curiously enough all the experiments made by Dr. Smith show in their results that the bread made with the Layton Baking Powder is more digestible than the ideal bread. If necessary I will show that.

By Mr. Cunningham: Yes, if you think it pertinent to the inquiry. A. The difference is small to be sure, but it is all one way, for instance, in the first experiment with the Layton bread the amount of nitrogenous matter in solu-

tion was 99.2 per cent. and with the control or ideal bread it was 99 per cent.

In the same way in the second set of experiments with Drs. Irish and Ross the results show in each case—not in the case of Dr. Ross the result was the same, but in the case of Dr. Irish, the gastric juice after the application of the Layton bread digested the moist albumen with which it was tested in one hour, and in the case of the ideal bread in one hour and a half.

In the case of the third set of experiments there is also a slight difference the same way as will be found by adding up the figures representing the percentages of the diet appropriated, it is slightly larger in the case of the Layton bread than in the case of the control or ideal bread.

The differences, as I have stated, are very small, but they are all one way and that is in favor of the Layton bread.

As to the first set of experiments it seems to me that two grammes is a very small quantity of bread to make any reliable tests upon, particularly when the amount of protein is only 6½ per cent. and the determinations were made on nitrogen on the basis of 1 of nitrogen to 6.3 of nitrogenous matter. It is dealing with exceedingly small figures.

The second set of experiments upon which Dr. Smith and Dr. Flint rely, consisted in feeding two healthy young doctors each with two grammes of bread after 12 to 16 hours fast and then in one hour withdrawing the gastric juice by the insertion of a tube and testing the gastric juice so obtained. It would seem to me first that for two healthy young men two ounces is an absurdly small meal after 12 to 16 hours fast to test the digestibility of food or the effect of such food on the gastric juice. It seems to me that the two ounces of bread under such conditions would stimulate the stomach to activity and give it too little to do. It would seem that the testing of gastric juice obtained an hour after such a meal and by the introduction of a tube, which would likely to excite unduly the secretion of such gastric juice, would hardly afford any valuable information for comparison; and second, the difference between the Layton bread and the ideal bread in a meal of two ounces so far as alum compounds introduced into the stomach are concerned, offers pretty small means of distinction.

According to defendant's witness, Dr. Keiser, a loaf of bread made by him with the Layton alum baking powder contained 10.17 grains of aluminum hydrate and his loaf weighed 14 ounces. In two ounces of such bread there would therefore be 1-7 or less than a grain and a half of aluminum hydroxide.

Concerning the third set of tests it should be noted that they involved a very large number of analyses and elaborate difficult analyses with quite a number of determinations in each. These would call for the services of an experienced chemist rather than of a physiologist. No detail is given as to the work in connection with these analyses, but in this connection I would refer to page 43 of the printed testimony of Dr. Smith.

"Q. What would be the test, Doctor, to show the presence or absence of free alum in bread? A. The test that I used was to treat the bread with water, and to test the solution obtained from which the bread had been separated by filtration, for the presence of the constituents of alum.

"Q. How test the solution? A. I tested it for the presence of sulphate by the addition to the solution of barium chloride and hydrochloric acid, and tested it for the presence of aluminum by rendering the solution slightly ammoniacal and noting whether a precipitate of aluminum hydroxide were formed.

"Q. Then in the bread did you or did you not find the presence of both of the constituents of alum? A. I did not."

In the first place determining the presence of sulphate and the presence of aluminum under such circumstances would not prove the presence of alum as such. There would certainly be the sodium sulphate present at all events and the sodium sulphate would be shown in his tests for sulphate, but he states he made no tests for this. The test for alum is also defective in that he did not provide for the organic matter present which would interfere with the precipitation of alumina. Errors in such matters of a more simple analytical chemistry would tend to cast doubt upon the accuracy and reliability of the more elaborate analyses that were necessary and whose results were acquired in the

third series of tests, but after all and assuming that the several experiments have been properly made and that to the results are in every way reliable, they can hardly be said to prove more than that a vigorous and healthy young man can for three consecutive days take alum baking powder bread at each meal with other food and not have his digestion noticeably disturbed.

It seems to me that the experimenter erred in the selection of his subject. A vigorous and healthy young man is almost universally one having the strongest and least assailable digestion. It is easy to understand that what he may take with impunity for a few consecutive meals would, when taken habitually, affect more or less unfavorably the digestion of the far larger portion of the community including children, elderly people and people of all ages who are not vigorous. These are the points that occur to me from the examination of that testimony.

Q. What do you say to the statement of Dr. Smith that alum or its constituents are found in almost all drinking water? A. Well, I should differ with him as to that. Traces of alumina are often reported as present in natural waters. It is a question whether phosphate precipitates are not mistaken for alumina in many cases, but I do not believe that alum or its constituents are found so generally in natural water.

Q. If you know from personal observation or from literature on the subject, please state what is the effect when alum is introduced into the stomach? A. It will retard digestion, tend to render the components of the food less soluble, less digestible in the gastric juice.

Q. And what would be the effect if introduced into the blood, if you know? A. It would be carried to several organs, as for instance, the kidneys, and they would be given greater work than they should under other circumstances.

Q. You mean in the elimination? A. In the elimination of the alum.

Q. State, if you know, whether or not there is a general popular prejudice against food containing alum? A. I think there is a very decided prejudice against food containing alum.

Q. Have you seen many specimens or packages of baking powders that are sold on the market? A. I have.

Q. Have you ever seen one that was market or indicated as containing alum?

Defendant's counsel objects to this question on the same ground that they have objected to similar questions; objection sustained.

Q. If in an alum baking powder there is an excess of alum above the amount necessary for complete decomposition of the sodium bicarbonate, will alum, in your opinion, be found in the residue? A. It will.

Q. In your opinion will alum in such case be found in bread made with such powder? A. It will.

Q. Will such residue or any part of such residue in your opinion be soluble in the stomach? A. It will.

By the Court: Wholly or in part? A. Wholly.

By Mr. Cunningham: Q. Do the residues left in bread by alum baking powders serve any useful purpose in the animal economy when such bread is consumed by human beings? A. They do not.

Q. Do you then consider alum baking powders healthful and wholesome when used in preparing food? A. I should not consider them healthful or wholesome.

Q. Do the residues left in bread, made with cream of tartar baking powders, serve any useful purpose in the animal economy when such bread is consumed by human beings? A. They do.

Q. Are the residues left in bread made with cream of tartar baking powders healthful and wholesome constituents of human food? A. I should think so.

Q. Do you then consider cream of tartar baking powders healthful and wholesome when used in the preparation of human food? A. I should think so, certainly far more so than the residues from alum baking powders.

Q. Prof. Potter, what is your age? A. I am fifty-four.

Q. You were once a professor in Washington University in this city? A. I was.

Q. What was your chair there? A. Mining and metallurgy.

Q. When you left there you said you built a sampling and testing establishment in the city of St. Louis, did you not? A. I did.

Q. You have been pursuing as your specialty since your professorship the science of mining engineering and metallurgy, have you not? A. Among other things, yes sir.

Q. You always hold yourself out as a mining and metallurgical expert, do you not? A. That is my principal occupation.

Q. Have you ever held yourself out as a general analytical chemist and have you any reputation, do you think, in that line? I think you have considerable in the other. A. I have for many years, probably twenty-five years at least, had a laboratory in which I carried on chemical work to some extent myself and with assistants doing general analytical work. The St. Louis Sampling & Testing Works is a large establishment of that kind including chemical laboratories as well as the testing plant, and a large part of the work that is done there in the chemical examination of not only ores and metals, but foods and food products and a great variety of substances. I never claimed at any time to be specially a chemist, although my training and experience ever since graduating has been along the line of chemistry.

Q. I am getting at now what work you yourself have done in the line of analytical chemistry and whether you have done any work of that kind to amount to anything that was not incidentally connected with your mining engineering and metallurgical work? A. I have done considerable chemical work outside of mining and metallurgy, but, as I have stated, chemistry in its application to mining and metallurgy I give far more attention to.

Q. Have you published any papers or monographs on the subject of analytical chemistry? A. No, I have not.

Q. For whom have you done purely analytical chemical work outside of your work of metallurgy and mining engineering personally? A. There is a great deal of work that comes to my establishment outside of mining and metallurgy requiring chemical investigation. I generally do not do much of that, but at times I do and have in the aggregate done a great deal.

Q. I ask you whom you have done it for? A. To answer more specifically the question asked, I would say that there are many establishments in this city whose chemical work I have done and to a large extent attended to personally, the particular names of parties I have not in mind at present.

Q. Well, will you tell me, if you can, in a general way the number of days you have devoted to work in the last five years, to generally analytical chemistry independent of the application to metallurgy? A. I suppose that probably half of the time that I am in the city I give more or less attention to work in the laboratory.

Q. Working yourself, Prof. Potter? A. Doing more or less work myself.

Q. Making all kinds of analyses in the range of analytical chemistry? A. Yes, but, as I said before, I do not do the principal work myself, that is done in the laboratory.

Q. You are the head of this institution, Prof. Potter, and you are quite busily occupied in conducting the business—it is a business, is it not? A. Yes, it is a business.

Q. I suppose like everybody at the head of a large establishment you cannot give the details your personal attention, you must leave them to your subordinates? A. Very generally, yes.

Q. Well, when did you first become interested in this case? A. Sometime last summer, I think.

Q. How did you happen to become interested? A. I had an interview with Major Cunningham in which he told me of the case.

Q. Major Cunningham, the attorney for the plaintiff in this case? A. The same.

Q. What did you do in the way of conferences and consultations with Major Cunningham and Dr. McMurtie who sits at his side and who has apparently been assisting him in this case? A. I had a number of interviews with Major Cunningham, I had not met Dr. McMurtrie until this case was called in this Court, or the day before I think it was called.

Q. Have you assisted in any way in preparing the case, and, if so, in what direction? A. What do you mean by assisting in preparing the case?

Q. Well, I think it is pretty plain, Prof. Potter, a case has to be presented in court and I wish to know whether you assisted in any way in securing evidence or advising them as to the proper course to pursue in developing the case and presenting it to the Court? A. Well, I have contributed to a certain extent in that way.

Q. State how you contributed to it? A. I discussed the principal features of such a case with Major Cunningham and referred to points that I thought should be presented and the character of testimony that should be brought out.

Q. Anything else? A. I stated to him the general line of experiments that I thought that I should make, and the bearing of those experiments.

Q. Anything else? A. I do not think at this moment of anything else.

Q. Do you mean to say, Prof. Potter, that you have done nothing else in this case towards presenting the evidence and securing witnesses for the plaintiff? A. I discussed with Major Cunningham the propriety of having physicians to testify and I interviewed several physicians with a view to their testifying.

Q. And you advised him on what line he should get medical evidence, did you not, Prof. Potter? A. I think very likely, I do not remember particularly as to that.

Q. You have no recollection of that? A. No distinct recollection of every matter that was discussed.

Q. How many witnesses did you go to see? A. I think some four or five physicians.

Q. Well, now, did you assist him in any other direction in procuring evidence, making suggestions as to the nature of the evidence he should introduce than such as you have already stated? A. I do not recollect of any other.

Q. No other at all, you have no recollection? A. I have no recollection at the present moment of any other.

Q. I see in your testimony, if I have got you correctly down, you answered this question "That is to say it retards digestion? A. Yes, sir; and produces other results, but as I am not a physiologist I do not pretend to say what all of those results would be, for, of course, I cannot tell what will take place in the stomach." To be accurate I

have procured a definition of physiology from Webster's Dictionary, as follows: "The science which treats of the phenomena of living organisms; the study of the processes incidental to, and characteristic of life;" now, in the sense that I have defined it are you a physiologist? A. No, sir.

Q. Have you devoted any portion of your life to experiments in physiology? A. I have not.

Q. Have you devoted any portion of your life to the special study of the science of physiology as such? A. I have not.

Q. Taking up your evidence, I do not want to be too long, but I do not fully understand it, it may be my fault, and it may be the stenographer's fault, I believe I have you down as follows—please look at your notes as I am going to base some questions on the table I give you and I want it correct; you say you found 6.95 of carbon dioxide in the analysis of the sample of baking powder that you analyzed, is that correct? A. That is correct.

Q. Of which you said 6 per cent. was available? A. That is correct.

Q. Then you said you found aluminum 4.02; is that correct? A. Alumina.

Q. Alumina, it ought to be? A. Yes, sir.

Q. You can appreciate that there may be some mistakes in the report of Prof. Keiser's testimony; alumina 4.02. A. That is correct.

Q. Sulphuric acid 12. A. Correct.

Q. Soda, 10.23. A. That is correct.

Q. Phosphoric acid, a trace? A. Yes.

Q. Starch, 48.89. A. Yes.

Q. Water by difference, 17.91. A. Yes.

Q. Making a total of 100. How did you procure 6.95 per cent. of carbon dioxide in your analyses? A. I determined first the available carbon dioxide 6 per cent.; I then determined the quantity in excess of that, that is it was combined, which would be set free by the amount of alum remaining in the powder; that was done by making a water solution of a weighed quantity and treating with normal hydrochloric acid and in that way getting the amount of soda, also carbon dioxide that is represented, so much for each cubic centimeter, and I found there was .95 of one per

cent. of such carbon dioxide in excess of the amount that would have been set free by the alum present. The two together made the total of 6.95 per cent.

Q. Well, how did you determine the six per cent. that you call available? A. That was determined in a regular acid apparatus, consisting of a flask and a chamber or reservoir to hold the water, and connected with this was a condenser and sulphuric acid bulb and beyond a potash bulb. There was a potash bulb also for the guard at the other end. A weighed quantity of baking powder was introduced and water carefully admitted from the reservoir until reaction ceased; it was then heated to boiling point and aspirated, air drawn through it to discharge what carbonic acid there might remain and the potash bulb was weighed and the additional weight was due to the carbon dioxide driven off by the acid alum from the baking powder, and from that percentage the six per cent. was determined.

Q. So I understand that the 6.95 per cent. total carbon dioxide is calculated— A. No, the six per cent. available was directly determined, the .95 per cent. was directly determined and the two together made the total of the carbon dioxide.

Q. Why didn't you get the total carbon dioxide in the first experiment? A. Because I used water only, which caused reaction between the alum of the baking powder and the sodium bicarbonate, that left the excess of sodium bicarbonate unacted upon and it required the action of acid upon it, if it was to be done in that way.

Q. Now, in giving the combination you report the total anhydrous alum to be 10.40? A. Correct.

Q. In the presence or excess of soda how much carbon dioxide will that much anhydrous alum give? A. What was the question?

(The stenographer reads the question).

By the Court: What quantity of anhydrous alum is mentioned there? A. 10.40 per cent.

By Mr. Seddon: How much do you say it will give? A. It will give six per cent.

Q. Do you mean to say that theoretically it will yield six per cent.? A. I mean that the reaction of that amount of anhydrous alum of the character that was present will yield six per cent. of carbon dioxide.

Q. Of what character was the anhydrous alum present, which you in your report there state total anhydrous alum, 10.40? A. It consisted of sodium sulphate 2.63 per cent.; aluminum sulphate 7.77 per cent., total 10.4 anhydrous alum.

Q. How did you determine those quantities? A. I determined the amount of aluminum sulphate, which is the active agent that would set the six per cent. of carbon dioxide free, and I found that that amounted to 7.77 per cent. The remainder of the sulphuric acid, after producing that amount of aluminum sulphate, that is the difference between the sulphuric acid in that and the total sulphuric acid determined, was given to the soda for sodium sulphate. Now, then, the question was what amount of sodium sulphate was in that combination with the aluminum sulphate to make the anhydrous alum.

Q. How do you get at that? A. I found by calculating back to what was the original condition of this baking powder before it deteriorated to the extent I found it had deteriorated, that is that the reaction had taken place, and aluminum hydrate and sodium sulphate had been formed as the result of that reaction, and I found the relation of sodium sulphate to aluminum sulphate in that original condition was nearly one-third of the aluminum sulphate as sodium sulphate, that the sodium sulphate in that alum was about one-third, the figures exactly were 4.36 of sodium sulphate to 12.9 per cent. of aluminum sulphate, as it was the same sort of anhydrous alum, that which was left in the powder as I found it; as that alum was in its original condition, I use the same proportion and that gave me 2.63 per cent. of sodium sulphate to 7.77 per cent. of aluminum sulphate; the remaining sodium sulphate there was sodium sulphate due to the extent to which reaction had taken place and I placed it with the aluminum hydrate in the figures that I gave.

Q. You said the sample had deteriorated and your calculation was made upon the condition of the material before it had deteriorated, did you not? A. I did.

Q. How did you assume the condition before it deteriorated? A. I gave back that which it had lost, that is the carbon dioxide that it had lost, due to reaction as far as it had taken place, reduced that to a percentage composition and then calculated each of the constituents present on that basis, nothing but carbon dioxide was lost in that deterioration that had taken place.

Q. What evidence had you that carbon dioxide had been lost? A. The fact that a part of the aluminum present in the baking powder that I analyzed was there as an aluminum hydrate and not aluminum sulphate.

Q. How did you find the aluminum hydrate there in the presence of the aluminum sulphate? A. I found that there was six per cent. of available carbon dioxide and no more in the baking powder. As I have already stated from that I determined that there was 7.77 per cent. of aluminum sulphate in the baking powder. Then I determined the amount of aluminum in that amount of aluminum sulphate, subtracting that from the total alumina I got the amount of alumina that was there in some other condition, and it could only have been there except to a very small extent, it could only have been there as aluminum hydrate.

Q. "Except to a very small extent," what do you mean by that? A. Well, in the roasting or drying of the alum there is likely to be some sulphuric acid driven off and a small amount of alumina would be left due to that.

Q. Then you calculated by six per cent. the amount of sodium sulphate present to be 7.77, did you? A. I calculated from the amount of available carbon dioxide that I found to be in the baking powder the amount of aluminum sulphate that was present and from that I calculated the amount of alumina in that aluminum sulphate, and deducting it from the total amount determined, gave me the amount of alumina in some other state, that it, as aluminum hydrate, which was due to the reaction having taken place.

Q. So that made 10.40 of alum, did it not? A. Yes, sir.

Q. Well, how do you calculate back to make six per cent. out of that? A. Well, knowing the character of the reaction by which the available carbon dioxide is set free, which is set free by that aluminum sulphate, I was enabled

to determine the aluminum sulphate that corresponded to that amount.

Q. I will ask you whether this is a correct calculation—the symbol for alum is Al2(SO4)3Na2SO4? A. Yes.

Q. Now, the reaction that takes place with soda bicarbonate, which I believe is 6HNaCO3, is it not? A. Yes, sir.

Q. Now, the reaction that takes place is 4Na2SO4, is it not? A. Yes, sir.

Q. Plus 2Al(OH3), is it not? A. OH6 plus 6CO2.

Q. That is 2AlOH6? A. Yes, sir.

Q. Plus 6CO2? A. That is right.

Q. That is the proper formula? A. Yes, sir.

Q. Now, the two atoms of aluminum—the atomic weight of aluminum is 27, is it not? A. Yes, sir.

Q. The two atoms will be 54? A. Yes.

Q. The sodium atomic weight is 23, is it not? A. Right.

Q. I beg your pardon, the sodium is 32, and there are three atoms there, that makes 96? A. Yes.

Q. Then, there is three of oxygen, multiplied by four, the weight is 16 multiplied by 4 and 3, that makes 192, does it not? A. Yes.

Q. Then the sodium, Na2, the atomic weight is 23? A. Yes.

Q. Multiplied by 2 makes 46? A. Right.

Q. The sodium—sulphur, the atomic weight is 32, one atom there, then there are four atoms of oxygen, 4 multiplied by 16 makes 64, the total makes 484, does it not? A. Yes.

Q. Four hundred and eighty-four parts of alum will liberate— A. It is not the alum that liberates. It is the sulphate of aluminum that does the liberation. The sodium sulphate has no part in that whatever. If you are anxious to get at this matter perhaps I can help you.

Q. I am anxious to get at it because we want to get it correct. I may not understand you correctly and I want to get a correct idea of what you have to say? A. What is your question then?

Q. Four hundred and eighty-four parts of anhydrous alum will liberate 264 of carbon dioxide? A. Well.

Q. Assuming that, Professor, how do you get the six per cent. I may be wrong but it seems to me there is a difference somewhere? A. Where did I get the six per cent.? I determined it by actually weighing it.

Q. Well, now what is the result there. Isn't it 5.67 per cent. that theoretically will be liberated? A. I don't know what your calculation will give. My calculation gave me 7.77 aluminum sulphate which does the business—that is liberates six per cent. carbon dioxide.

Q. If 484 parts anhydrous alum will liberate 264 of carbon dioxide then 10.4 parts will liberate how much? A. I do not know.

Q. Do you refuse to make the calculation? A. It is a waste of time. Let me show you how I get at it.

Q. I wish you would answer my question. Doesn't it make 5.67 per cent.? A. How can it make 5.67?

Q. Doesn't it make it? A. No, sir; it doesn't make it.

Q. Isn't 484 to 264 as 10.40 is to X, so that the X in that case would be 5.67? A. I have no doubt your calculation is correct. I have not gone over it. I think your figures are probably correct.

Q. Well, then theoretically the anhydrous alum should liberate 5.67 of the carbon dioxide should it not? A. Well, you are taking sodium sulphate as doing some of the liberation which it does not. It is the aluminum sulphate that liberates the carbon dioxide. I can give you the figures.

Q. But theoretically doesn't it produce that result? A. On the basis that you mention it does. That is your proportion is correct.

Q. I am asking you, then, if that is not the correct amount of carbon dioxide liberated by that amount of anhydrous alum? A. I stated that it was six per cent. which is more than you get theoretically. You are taking something theoretically yourself and I am taking something practically. I made the analysis of the baking powder that was under consideration.

Q. Didn't you determine the results by calculation and not by actual determination? A. It is not calculation, it is actual determination.

Q. Didn't you determine that 10.40 by calculation? A. Necessarily partly by calculation. There was a basis of determination for that calculation.

Q. Then there must be some mistake in the calculation? A. That does not follow.

Q. You calculate six per cent. theoretically? A. I calculated nothing theoretically.

Q. Didn't you calculate what there would be from the six per cent? A. I had to get a basis of fact for my calculation which I did by determining six per cent. available carbon dioxide in this baking powder. That is a basis of fact.

Q. Now then I find that 10.40 will, by my calculation, liberate 5.67 carbon dioxide? A. I don't understand your calculation Judge. I am trying to make this matter clear to you as I can. I stated to you that the aluminum sulphate which does the liberation was 7.77. The anhydrous alum has nothing to do with the liberation any further than aluminum sulphate is in the anhydrous alum.

Q. Well, you report 10.40 anhydrous alum? A. Yes, sir; that is the amount.

Q. We are agreed on what is the atomic weight of alum? A. Yes, sir.

Q. Now you say it is the aluminum sulphate in the anhydrous alum that liberates the carbon dioxide and the sodium sulphate has nothing to do with it? A. Yes, sir.

Q. Now then what I want to know is that wouldn't your 10.40 anhydrous alum, given in your formula liberate exactly 5.67 carbon dioxide? A. I stated that it would liberate 6.

Q. Why do you state that? A. I stated that because I found it to be the fact.

Q. How do you explain the difference between the results. I stated what I believe to be the true proportion? A. Well, if you will allow me to explain, anhydrous alum isn't all a fixed composition. That is to say the proportion of sodium sulphate and aluminum sulphate is not definitely fixed. When you take your atomic weights you are getting something fixed and definite. You stated that 484 would be to 264 as 10.40 is to 5.67, which is undoubtedly correct. That is to say I have not verified your calculation, but I assume your figures are correct. As I stated a moment ago when you take atomic weights you are getting something fixed and definite. Now, as a matter of fact, the proportions of sodium sulphate and aluminum sulphate are not

always definite and fixed in the alum and it is the aluminum sulphate in the anhydrous alum that does the work, that is to say, performs the reaction and sets free the carbon dioxide which is as I stated in this case the available carbon dioxide and because it is actually set free and available, I call it available carbon dioxide, which I find by actual determination to be 6 per cent. carbon dioxide set free by the aluminum sulphate in the anhydrous alum and I was therefore able to find how much of the aluminum sulphate there was that set that 6 per cent. free and I got it by taking the atomic weight of the 6 per cent. carbon dioxide, and the atomic weight of the aluminum sulphate which gives me 7.77 aluminum sulphate. Now then having the aluminum sulphate of the anhydrous alum I set to work to determine how much sodium sulphate there was.

Q. How did you determine that? A. I went back to the original composition of alum and in determining what took place—that is to say I found the original composition of the alum when the aluminum sulphate was there present before the reaction had taken place and the hydrate of aluminum had been formed and I found the proportion which existed between the sodium sulphate and the aluminum sulphate in the original alum. Those proportions I gave you.

Q. In other words you calculated that amount from the 6 per cent. carbon dioxide which you found in the baking powder and it is therefore an inference on your part because you never saw what went into the baking powder and did not see it in its pristine state and you arrived at the sodium sulphate 2.63 which added to the aluminum sulphate gives you 10.40 pure anhydrous alum, is that true? A. Your result is true as you stated. I didn't take your way of doing it though.

Q. Well, if there is anything wrong about my way of stating it I would like to know it? A. It is a legitimate calculation based on facts.

Q. And I was trying to get at those facts?

The Court: You say you first determined the amount of available carbon dioxide? A. Yes, sir.

Q. From that you calculated the amount of aluminum sulphate present, as such, in the baking powder you examined? A. Yes, because it is the aluminum sulphate that sets free the carbonic acid.

Q. Now then, you say that in order to determine the amount originally present in the powder, you determined that from the amount of carbon dioxide? A. No, if you will allow me. Not from the carbon dioxide, but the aluminum hydrate. The point is this I wanted to find out what proportion of sodium sulphate is combined with or is associated with the aluminum sulphate. It is not always the same. It varies. Now I calculated back to the original condition where I had all of the alumina present. That is the point which I was trying to ascertain.

Mr. Seddon: That is just the point we are after. How did you calculate it back to the original? A. It was done in this way: Part of the original alum, that is to say, the aluminum sulphate had reacted with the sodium bicarbonate producing a certain amount of aluminum hydrate and sodium sulphate. Now then, nothing had been lost from the baking powder except the carbon dioxide which was set free due to the reaction. I calculated the amount of carbon dioxide set free by this reaction that took place, and then changed it to a percentage composition which gave me 6. I then figured each one of the constituents separately and I finally got the amount of aluminum sulphate which included all of the alumina and the amount of the sodium sulphate associated with it. That gave me a definite set of figures and I estimated properly that the alum that was left which had not been combined had the same proportions of sodium sulphate and aluminum sulphate that it originally had. Only a portion of it had combined and having found the percentages of the portion that had combined, the combination not having changed the proportions of the alum, for that reason I was able to give the same composition, that is, the same proportions of the sodium sulphate and the aluminum sulphate for the alum that remained. I deducted or rather I found the amount of alumina and by deduction I found the amount present as aluminum hydrate.

Q. Is it impossible to determine the per cent. of aluminum hydrate as such? A. Perhaps I had better go over that again in order that there may be no mistake about it. I will repeat it. Having determined the available carbon dioxide and knowing that it was the sodium sulphate that was

the active agent in setting free the carbon dioxide I found that there was 7.77 aluminum sulphate and from that I got the amount of alumina in that 7.77 aluminum sulphate and deducted that from the total alumina that was there as the hydroxide, that is the 2.60 item. Now then, I went back to the original composition of the alum when the alumina was present as a sulphate of aluminum and found the proportions of sodium sulphate and aluminum sulphate as they originally existed. By deducting that amount from the total sodium sulphate I got the sodium sulphate that is due to the reaction, 9.01.

Q. Now Professor, if you are through I will read you the figures which I understood you to give last night, as follows: Anhydrous alum, in this composition, sodium sulphate 2.63, aluminum sulphate 7.77. Total 10.40. Is that right? A. Yes, sir.

Q. Aluminum hydrate 2.6. Sodium sulphate 9.01. Sodium bicarbonate 13.27, of which 11.45 per cent. were available after reaction with the remaining alum and 1.82 per cent. sodium bicarbonate in excess. Those make 13.27. Soda in excess .23, starch 48.89, water by difference 15.6? A. Yes, sir; that is right.

Q. Now what I want to get at is what items of that table did you get by direct and actual test and not by calculations based on something else? A. I determined the starch by actual determination. The others are the results of calculations which I made based upon the determinations of each of the ingredients.

Q. You ascertained as I understand it the amount of sodium sulphate and aluminum sulphate in the anhydrous alum as 2.63 and 7.7 respectively. You say that by going back to the original condition of the baking powder and calculating the proportion you found the sodium sulphate, is that true? A. Yes, sir.

Q. Now, I didn't quite catch you as to how you got the original condition of the powder? A. From an analysis of the powder as I found it I knew that deterioration had taken place and I knew that nothing had gone away or escaped from the powder except the carbon dioxide. I knew that nothing else could possibly get away, as the result of that reaction, and I knew that it was from the powder, the

aluminum sulphate in the powder that the amount of aluminum hydrate present had come.

Q. Did you say that was the condition of the powder at first? A. Well, I don't say that that was the condition of the powder at first, but certainly nothing could get away and it is reasonable to suppose that it was the original condition of the powder before the carbon dioxide had been set free. When I found the amount of aluminum hydrate I reduced it to a percentage composition.

Q. What do you mean by a percentage composition? A. I mean so many parts in a hundred.

Q. Well, go on? A. Knowing the amount of aluminum hydroxide I determined—knowing the amount of aluminum hydroxide and knowing that originally it must have been present as an aluminum sulphate in the original alum, I converted that aluminum hydrate into aluminum sulphate which gave me the aluminum sulphate that had set free the carbon dioxide and deducting that amount I found 4.4 per cent. I added that to what I had before of the ingredients of the powder as analyzed which gave me 100.4. I reduced the percentage composition of each ingredient finding what proportion it would be of 100 instead of 100.4.

Q. But the whole things turns on this, that you got back to the original composition by estimating 6 per cent. available carbon dioxide? A. I don't believe I quite understand your question.

Q. I mean the original composition of this article was based on the correctness of the 6 per cent carbon dioxide? A. I ascertained the amount to be 6 per cent. carbon dioxide available.

Q. Now then, let me get at it this way. If I understand you, everything except the starch, 48.89, which you made by direct determination, was based upon the correctness of the figures which you gave as 6 per cent. total carbon dioxide? A. That is right.

Q. Don't chemical analyses vary somewhat. Is it possible to make an absolutely perfect chemical analysis? A. No.

Q. Isn't it the best we can do to make a number of determinations and take the average? A. We always allow for experimental errors in determining the amount within proper limits.

Q. How many determinations did you undertake in order to arrive at your 6 per cent. total carbon dioxide? A. I made two, four, six, six actual and direct determinations.

Q. You made six actual determinations? A. Yes, sir.

Q. And on that you based you calculations, is that right? A. My calculations were based upon the facts as shown by these determinations. I made six determinations. I did not make one or two and then calculate from that.

Q. Did you make any qualitative analysis of the baking powder? A. No, sir.

Q. None at all? A. No, sir; I had no reason for making any.

Q. I merely asked you the question? A. No, sir; I did not.

Q. Now you will remember in your first table you got water by difference 17.91. After determining the total soda the total carbon dioxide, total sulphate of alumina, sodium sulphate, phosphoric acid and starch you subtracted from 100 you say, which gave you the water by difference? A. Yes, sir; that is correct.

Q. Now then, in your experiment you made that with one measure of baking powder of course? A. Well, let me explain about that. In making this test I did not test just one portion of the baking powder. I mixed it together thoroughly and then after mixing it I took small parts here and there from the mass to make up the quantity which I proposed to use and in that way the sample which I took fairly represented the whole material that I had.

Q. And in making another analysis you found the elements as before and deducted them from 100 and obtained the water by difference? A. Yes, sir.

Q. Now how did you determine that that difference was water? A. Well, I will say in that connection that there certainly was nothing left except a very small amount of silicious matter, but it was so insignificant that it could not enter into the calculation. I knew that we had starch and I knew also that starch contains water. What you might call air dry starch will ordinarily have 18 and sometimes more per cent. of water. Starch in fact readily takes up water and it is put in the baking powder for the purpose of taking up and keeping out of the way from the other ingre-

dients any moisture so that there may be no reaction between the active ingredients of the baking powder before it is intended to be used. There is also likely more or less of the water in the alum as it was in its original condition as some may not have been driven off in the drying process. I knew there was water and I knew at the same time there was nothing else. In that connection let me state to you that you asked me if I made a qualitative determination and I said no. As a matter of fact I made no such determination except incidentally. Very often in going along a person will make a qualitative test incidentally when his main object in view is a quantitative test. These qualitative tests as I say are made incidentally as you go along and are often made for the purpose of determining things incidentally and are not necessary in making just an actual quantitative test.

Q. How then, without making a qualitative test could you determine that that difference was water and nothing else? A. I knew there was nothing else that could be present except in such minute quantities that it would not make any difference. I satisfied myself of that.

Q. How then, could you tell that or satisfy yourself of it without making a qualitative test? A. In making an analysis of that kind a person often makes these determinations in a qualitative way to satisfy himself, for the purpose of the investigation, and I satisfied myself that there was nothing but water that was left.

Q. I may be wrong and if so I wish you would correct me, but in the first table you gave water by difference 17.91? A. That is correct.

Q. And in the second table you gave it as 15.6? A. Yes, that is corret.

Q. Now then, how do you account for that difference? A. If you will examine those tables you will find that in one case I have reported alumina and in the other case part of the alumina is there as aluminum hydrate and in that case the water is taken up to produce the hydration making the aluminum hydrate. Do I make myself understood?

Q. Yes, I think so Professor. As I understand it the difference comes in that part of the water is taken up to produce the hydration? A. Yes, sir.

Q. Now you speak of soda in the first table as 10.23? A. Yes, sir.

Q. What is the chemical symbol of the element there? A. Na2O. We call that soda.

Q. Well, soda is not Na2O, is it? A. Well, call it sodium oxide.

Q. I wanted to get it down right. You are a chemist. A. I was endeavoring to help you all I could.

Q. Isn't soda Na2CO3? A. No, sir.

Q. What is Na2CO3? A. That is sodium carbonate.

Q. Isn't sodium carbonate often called soda? A. Some people speak of it that way.

Q. What is that made of? A. That is composed of sodium with carbonic acid gas.

Q. How did you get soda in excess .23? A. Well, that was just the difference. In the combination with the sulphuric acid in the alum the sodium sulphate results from the reaction and I reported that amount of soda as excess because I was honest and did not divide it up among the other things.

Q. How do you mean? A. I did not calculate the soda as all bicarbonate as Doctor Keiser did.

Q. You say that you estimated that there was .23 in excess? A. Yes, sir.

Q. What is that? A. That is the normal carbonate.

Q. How do you know that is the normal carbonate? A. Because that is the excess soda that exists as soda and not as bicarbonate. It remained in the alum as .23 excess of soda.

Q. Didn't it come from anywhere else? A. It could not have come from anywhere else I had it as an excess.

Q. You don't think it could have come from an error in the calculation—an error in the analysis I mean? A. No, sir.

Q. Now Professor, I don't quite understand in your testimony how you got at this 62.5 per cent. in the hydrochloric solution test which you spoke of. I wish you would explain that? A. You will remember I explained yesterday that I took a sample of the baking powder, wet it and put it in a bag, enclosed the bag in the dough and baked it in the oven. Now after baking the powder in that way I determined the alumina there as hydrate of aluminum. I found that I had 3.2 per cent. alumina in the incysted sample. That corresponds to 4.9 aluminum hydroxide.

Q. 4.9 per cent. aluminum hydroxide in that sample? A. Yes, sir.

Q. Well then, go on and make your explanation? A. I then tried a portion of the baking powder that had gone through the baking process, in a .25 per cent. solution of hydrochloric acid. I found that of the total 3.2 per cent. in the baking powder, 2 per cent. had gone into the solution and I found that 2 per cent. represented 62½ per cent. of the original alumina that was in the sample.

Q. Do you know anything about the composition of flour? A. Well, I have never made any exhaustive tests. I think I know something about it.

Q. Can you give us the elements that are contained in the flour? A. Well, it consists mainly of starch and gluten and ash.

Q. I am not asking you for the mixture. I am asking you for the elements that go to make up the flour. I mean the distinct chemical elements? A. I do not think I understand the question the way you put it.

Q. I will withdraw the question as I have put it and will ask you to give us the distinct chemical compounds that exist in the flour? A. I gave you the starch and the gluten.

Q. The gluten is a mixture of several elements is it not? A. Yes, sir.

Q. I am not asking you for the mixture. I want the component elements if you can give them? A. I do not know that I am sufficiently familiar with the composition of flour to give you all of the ingredients.

Q. Of course if you cannot throw any light on the subject there is no use my going into it. Is there sugar in flour? A. I suppose there may be.

Q. It is not a question of supposition. It is a question of what you know? A. I take it for granted that there is.

A. Is there any compound in the flour with which aluminum hydrate forms insoluble compounds? A. There may be.

Q. What are they? A. I don't know what they are.

Q. You don't know? A. No.

Q. Then why do you say that there may be? A. I assumed that there may be or that there must be because I have often found that something interferes with the pre-

cipitation of the alumina by the solution of ammonia, but when there is no organic matter present it precipitates very readily.

Q. Have you made actual tests of that? A. Yes, sir; I find it to be a fact.

Q. That they are found? A. Yes, sir.

Q. Now Professor in your experiments you say that you took two solutions, in one you found there was no precipitate of alumina and in the other that the alumina was precipitated? A. Yes, sir.

Q. Can you tell us how you made those experiments? A. I took a quantity of the bread and digested it with a .25 per cent. of hydrochloric acid. I then divided the solution and in one case I evaporated it to dryness, ignited it, destroyed the organic matter and then tried it with a solution of ammonia and found that there was a precipitate of alumina.

Q. Now did you filter the second solution? A. I stated that I dried it and burned off the organic matter and treated it with a little hydrochloric acid and then precipitated the alumina with a solution of ammonia.

Q. What did you get? A. I got a precipitation of alumina.

Q. How did you know that it was alumina? A. Because I took the precaution to find that out.

Q. It may have been phosphate of alum may it not? A. Possibly it might if I had tried it simply with the ammonia, but I added a little sodium phosphate, a little hydrochloric acid and a little ammonia acetate and then got a precipitate which could only be phosphate of alumina.

Q. Why do you say that? A. Because I had sufficient sodium phosphate to supply it with phosphoric acid.

Q. It was precipitated as phosphate of alumina? A. Yes, sir.

Q. How do you know that it was not calcium phosphate? A. Because under those circumstances calcium phosphate would not have been precipitated.

Q. What would have prevented it? A. The ammonia acetate.

Q. Now, what did you do with the other sample? A. I dried that in the same way. I evaporated it to dryness—

Q. I referred to the solution in which you say you did not destroy the organic matter? A. Oh, yes; I understand you now. In that case I filtered it—

Q. Through what? A. Through an ordinary filter paper.

Q. You did not dialyze it did you? A. No, sir; I did not.

Q. Don't you know that the paper you used would not hold back the organic matter? A. I think the test showed the impossibility of getting rid of the organic matter in that way.

Q. How do you mean? A. I mean that by the use of an ordinary filter of that kind the organic matter would go through at least in part.

Q. Then what? A. If you did not guard against the presence of organic matter in the solution you would not get your precipitate, hence you would think that there was no alumina in the solution. This test showed the impossibility of getting rid of the organic matter and showed also that the alumina would not be precipitated in the presence of the organic matter.

Q. If you had passed it through a dialyzing membrane would you not have gotten rid of the organic matter? A. How could I be sure of that and how could I be sure that the organic matter did not still interfere with the precipitation of the alumina?

Q. Isn't that a perfect method of determining the presence of alumina? A. No, sir; it is not.

Q. You say it is not a perfect method of determining the alumina? A. It is not a perfect method of separating the organic matter in the flour from the aluminum salts.

Q. Now, in one of your experiments you say that you found that hydrate of alumina was soluble in water. Did I understand you correctly in making that statement in your testimony? A. I made the statement that the aqueous extract of the bread, that is, the solution resulting from the digestion of the bread showed a trace of alumina.

Q. A trace of alumina? A. Yes, sir, that is I precipitated the alumina.

Q. Professor, perhaps I may be mistaken in what I thought your testimony was or the stenographer may have

gotten it down incorrectly, but as I remember your testimony it was that you digested a portion of the bread in cold water for twelve hours and then tested it for alumina and that you found a trace of alumina in the aqueous solution showing that part of the aluminum hydrate is soluble? A. I don't think I said aluminum hydrate.

Q. That is the way it is reported here, "showing part of the aluminum hydrate is soluble." A. What I should have said is part of the alumina is soluble. Part went into the solution, but I did not say that it was there in the condition of the hydrate. I said that part of it went into the solution.

Q. Did you make any test to ascertain whether there was free alum in the bread that you baked? A. I made the test which has just been referred to, of digesting the bread with water; if there had been free alum it would have gone into the solution and the alumina that would precipitate would have been due to that; as I found an excess of sodium bicarbonate over that that was necessary to neutralize all the alum, I would consider that it was not there as alum, but it is still true that a small amount of alumina was dissolved by water.

Q. Then, I understand, that you did not satisfy your mind on the question whether there was free alum in the bread, but rather assumed from the fact of the proportions of bicarbonate of soda and alum that there was not? A. That is the case.

Q. When you digested in hydrochloric acid and burned off the residue, in what kind of a receptacle did you evaporate it? A. A platinum dish.

Q. Did you find much alumina in the test in this case that you speak of where you burned off the residue? A. Quite a strong precipitate.

Q. Did you weigh it? A. I did not, it was to simply determine whether the organic matter interfered, so I made the two solutions, the one that still contained organic matter, and the one in which it had all been destroyed; I found where I had destroyed the organic matter I got the strong precipitate, and in the other case I did not, I did not get any, showing clearly that whatever the state of the organic matter it did interfere.

Q. Isn't it a fact that alumina, when evaporated to dryness, as you described and then it is ignited, that it is insoluble in hydrochloric acid? A. No; it is rendered less soluble, of course.

Q. Isn't it true that ignited alumina is dissolved by diluted acid with very great difficulty? A. Yes, I have already stated it was less soluble, but it is soluble and I found it to be soluble because it was precipitated.

Q. In what kind of a dish or receptacle did you digest the solution in hydrochloric acid? A. Which do you refer to?

Q. The one that you are speaking of, and I understand you digested it in hydrochloric acid? A. Well, I digested the bread in hydrochloric acid, did you mean that?

Q. Yes, sir. A. In glass, a glass beaker.

Q. Is hydrochloric acid liable to take up alumina from the glass? A. Well, if it did it would be the same in both solutions; the final solution was tested, the one with organic matter and the one without it were treated the same way, and where the organic matter was removed alumina was found, and in the other case it was not.

By the Court: Can you answer the question directly whether or not the hydrochloric acid would be liable to take up any alumina from the glass beaker? A. In the first place that is thin glass and it would have an extremely small amount of alumina, and the amount of alumina that could be taken up from the glass would be beyond determination or observation; alumina is not an important part of the composition of glass.

By Mr. Seddon: I believe that Prof. Mallet and Prof. Prescott, who both qualified as being eminent men in their line, approved of the method of separating the crystalline organic matter from the alum referred to; do you think their authority is of any weight?

Mr. Cunningham: Wait a moment. I want to ask you, Judge, if you want the remarks of either of those gentlemen criticised to read them to the witness, or make out a hypothetical case. I must say, with all due regard to

my friend, Judge Seddon, this is a very doubtful basis for criticism. If any question on the matter is to be put to him there should be read to him, at least, what was said by Prof. Mallet and Prof Prescott.

Mr. Seddon: It would be impossible for me to look up the exact language now.

The Witness: Well, I would say—

Mr. Cunningham: If you care to answer in that way, all right.

The Witness: Well, I would say that I do consider them very able authorities. The statement as you make it in the question is all right. By such an experiment you can separate crystallizable material from non-crystallizable material, but how would you know whether your organic matter—the condition or character of your organic matter. and how are you to know the condition or character of the diaphragm used.

By Mr. Seddon: Q. What? A. The diaphragm used, is it a true diaphragm that is used? That would make a difference, whether it was a true membranous diaphragm.

By the Court: Is there any difference in that respect, between a membranous diaphragm and a parchment diaphragm? A. Well, toughened papers are hardly a proper substitute for a membranous diaphragm that is used for that purpose.

By Mr. Seddon: You criticised Prof. Keiser's testimony and these grave errors, on page 128, for instance, where he refers to the determination of sodium sulphate and states that sodium sulphate was precipitated by barium chloride? A. Yes.

Mr. Cunningham: What page is that?

The Witness: Page 128.

By Mr. Seddon: Isn't sodium sulphate precipitated by barium chloride? A. No, it is not.

Q. Doesn't barium sulphate come down as an insoluble powder? A. Barium sulphate does, but not sodium sulphate; you said sodium sulphate and so did Dr. Keiser.

Q. It comes down in the form of barium sulphate, doesn't it? Is that a quibble of words? A. Yes, sir; a great deal—

Mr. Cunningham: Judge, won't you read to the Professor what appears that you are having him to criticise there?

Mr. Seddon: Yes, sir.

The Witness: No such statement can be justified, certainly.

By the Court: What sort of insoluble compound, if any, would that produce? A. Barium sulphate would come down and leave the soda in solution, you add the barium chloride and the barium goes to the sulphuric acid and leaves the soda, the soda had nothing to do with the precipitate, it is very different.

By Mr. Seddon: Can you refer us to that page? A. If I had a copy of the testimony I could, I have page 128, it is the pencil paging.

By Mr. Cunningham: What is the other number? A. 17 is the typewritten number.

Mr. Cunningham: Judge, if you had all the testimony written up it would be 128; if you had Dr. Keiser's testimony written up separately it would be 17.

By Mr. Seddon: Isn't it a common expression in chemistry to say that the sulphate of sodium is precipitated by chloride of barium, or barium as sulphate of barium? A. No, it is not; it is very incorrect.

Q. How would you state it? A. Why, if you have a solution containing sodium sulphate and you are determining the sulphuric acid, you add, after adding hydrochloric acid, a slight excess of barium chloride, and barium sulphate

would be precipitated last, filter and weigh, and from that amount calculate the amount of sulphuric acid.

Q. I suppose that is a matter of elementary knowledge, isn't it, that sulphate of barium would come down? A. Yes, and that makes it all the more remarkable that sulphate of sodium should have been spoken of as having been precipitated.

Q. Wouldn't you think, when you are referring to a man of Prof. Keiser's reputation and age, that there must have been some mistake in reporting him, that he meant sulphate of barium? A. Well, it is repeated so often that it seemed that it hardly could be the reporter's mistake, I noticed other expressions in the same way.

Q. Before you come to that, let me ask you this: Prof. Keiser says, "I then calculated the amount in percentage of the sodium sulphate present;" he certainly would not count the percentage unless he counted the percentage from something, if it was precipitated he would have the sodium sulphate there, if it were possible to make such a statement—he would have it there to weigh without calculating it, would he not? A. Well, I should certainly take it for granted that Dr. Keiser knows better than this statement indicates, but the statement is there and I referred to it.

Q. You have said there were a good many statements in your testimony that were taken down wrongly, it is very difficult to take this technical testimony down correctly. A. I believe in my direct examination I made that statement that I thought some of these errors that I called attention to in Dr. Keiser's testimony were probably due to the stenographer, but it did not seem to me that this was one of them; I thought this was more carelessness in statement, but there are several others of the same kind that I did not refer to that I might have, for instance—

Q. Now, Professor, unless Major Cunningham wants this volunteered testimony, I would rather that you omit it.

Mr. Cunningham: If the Court please, it seems to me it is entirely out of order to call upon Prof. Potter to apologize for Prof. Keiser's mistakes. I think the whole thing is entirely irrelevant and incompetent.

The Court: If you desire the witness to finish his answer he may do so.

Mr. Seddon: Go on, Professor.

The Witness: Well, I was only going to refer to several other instances of the same kind.

Mr. Seddon: You need not refer to them.

Mr. Cunningham: That may be just as you choose, Professor.

The Witness: I thought the Judge asked for the question to be read.

Mr. Seddon: No, I did not ask him to read it.

Mr. Cunningham: Do you want him to go on?

Mr. Seddon: The Court said he could do so.

Mr. Cunningham: Do you want him to go on?

Mr. Seddon: I didn't ask him to.

The Court: Very well, let the matter stand as it is then.

By Mr. Seddon:

Q. Another criticism that you made is this, on page 151 you state he says: "I first took a quantity of the baking powder, weighed it carefully on an analytical balance, as before, after which it was placed on a platinum dish, properly muffled and the starch burned off. A white ash was left which was dissolved in dilute hydrochloric acid and then filtered, after which we have in the solution oxide of sodium, oxide of aluminum, sulphuric acid and hydrochloric acid. I then added chloride of barium to carry down the sulphide (it should be sulphate) of aluminum, and the alumina, and then we have nothing left but the sodium chloride in the

soultion that remains. In order to remove any compound of barium that might remain a stream of carbon dioxide was passed through, after which the solution was filtered and the filtrate carefully dried, and after having been thoroughly washed and ignited, the weight of the sodium oxide was thus obtained." You say, "It is difficult to see why the carbonic acid was introduced as it certainly would not remove the barium chloride." Now, if you substitute the carbonate of barium it would carry down the sulphate, and I suppose that that would be right then?

Mr. Cunningham: I object to that. It has not anything to do in the world with the criticism except the witness is asked if one word should be substituted for another, it does not make Dr. Keiser's statements and conclusions consistent with what this witness thinks; I object to that absolutely.

Mr. Seddon: I want to show that it was impossible for a man of Prof. Keiser's reputation, if gotten down correctly, to make such a statement, and I want to show if it is made it is incorrect.

The Court: The witness may answer the question.

The Witness: Yes.

Mr. Seddon: Prof. Keiser says he is not concerned about it and I will ask no further questions about it.

Q. I understand you testify the majority of the opinion of scientists and medical men is that the use of alum in baking powders, or rather the abuse of the use of the baking powders made with alum, was an injurious food product, do I understand you correctly? A. I don't remember the language that I used, but I would certainly say that of all the statements that I have seen, from physicians and others, the large majority consider the use of alum in baking powder, which is to be used for making bread food, objectionable.

Q. You are not a medical man in any sense I suppose? A. No, sir; I am not.

Q. You have never taken a course of medicine? A. No, sir.

Q. You have never studied medicine collaterally to your profession, have you? A. No, sir; I have not.

Q. You have no more knowledge of medicine and medical men than any other well informed scientific man, have you? A. No.

Q. Therefore, you would not be a very competent judge to state what is the majority of opinion of the medical world, or the scientific world, would you? A. Well, the statement that I made was that the vast majority of the statements that I had seen and heard from medical men and others was that alum in baking powder was objectionable.

Q. We didn't understand it that way; did you ever see the use of alum baking powder in the prepartion of food condemned by any scientist in any standard work? A. Yes.

Q. What? A. I don't recall the references just now, but I have certainly seen in a number of cases the statements made—

Q. I am not asking about fugitive statements made, but I am asking about a good standard work on medicine or food? A. Well, I don't know that I have seen in any medical book any such statement.

Q. Do you know that one of the greatest authorities on foods written in the English language has stated as his deliberate conclusion that he did not think they were injurious, after stating in detail the experiments on which he bases his opinion, are you aware of that, Mr. Blythe? A. I have seen a number of statements of Blythe's but it seems to me in most cases they were not decided, they were not definite as favoring the use of alum in baking powders, or stating that they were harmless, it was rather that the opposite view was not proved, showing that he was not prepared, as yet, to say it was clearly proved that they were harmless.

Q. I quote from A. Wynter Blythe, Foods, Their Composition and Analysis, fourth edition, published in 1896, which Professor——

Mr. Cunningham: Your Honor, I will have to object to that, and the question being predicated on that, for the same reason that the Court excluded evidence in books of

that fact. I think the witness has given his answer to the question and I do not see what good comes now of putting to him a pointed question. I do this merely to save time.

Mr. Seddon: He says Blythe gave a qualified opinion on the subject. He seems to be familiar with it and I want to read it to him and see if he does not recollect it. He does not want to be put on record falsely and I don't want to put him there.

Mr. Cunningham: I object, your Honor, to it as irrelevant.

The Court: The objection will be overruled.

By Mr. Seddon:

Q. (Reading) "It will be found that generally the medical profession believes that alum even in small doses acts injuriously on the human animal organism. It is certainly true that a person may be poisoned by taking a sufficiently large dose of burnt alum, or of the crystalized solid alum, or even a large dose in concentrated solution. It has also been satisfactorily established by Siem that if animals are treated by sub-cutaneous doses of alumina salts a peculiar nervous condition may be produced, similar to the disease known as bulbar paralysis. On the other hand, it is a question whether in the moderate doses in which alum is taken in pastry or bread, or cakes, the flour of which has been mixed with alum or an alum baking powder, it has the slightest appreciable influence on health. The writer and the writer's family have used, off and on, alum baking powders for years without injury. The fact that tons of alum baking powders are sold every week must show that a vast number of persons use alum baking powders, and yet no special malady has been recorded. To unintentional experiment there is added direct evidence, Christoph Schmitz gave a dog for three weeks aluminum acetate mixed with sausage; the dog took in 21 days 99 grammes of alum acetate, and gained in weight half a kilogram. To the same dog was given for 120 days, each day some 35 cc. of a solution of aluminum acetate, the total amount taken being equal to 260 grammes

of aluminum acetate, and the dog increased in weight 2 kilos. Schmitz himself took, for 31 days, 15 drops of the same solution, the total amount equaling 2.4 grammes of the solid acetate, and failed to find his health in any way affected. "Two young doctors took, for 33 days, 1 gramme of the tartrate of aluminum also without effect. Schmitz carefully examined the urine of his experimental dog, but could not obtain more than feeble and doubtful evidence of a trace of aluminum hydrate, and he comes to the conclusion that aluminum compounds in moderate doses are not absorbed by the human intestine. I am therefore decidedly of the opinion that alum in food in reasonable quantities is not injurious to health." Isn't that a pretty positive opinion on that subject, or is it what you refer to as a qualified opinion? A. Yes, that certainly seems to be a somewhat decisive opinion of his, but it is qualified still, somewhat, he says, in reasonable proportions——

Q. He speaks of alum baking powder? A. He was speaking of that?

Q. Yes. A. Well, in this connection I might point to the result of my analysis, showing that this baking powder, which I happened to run across was a weakened, deteriorated box, and that might often happen, in which case, unreasonable amounts might get into the system; that is a danger, perhaps, that he had not thought of.

Q. Now, you speak of popular prejudice, what do you know about popular prejudice? A. Do you mix much with the people or are like the rest of us who touch the people in very few ways in our lives? A. Well, this question of alum in baking powder has been up and talked over for a good many years, and I have run across a great many people who have talked about it, and it seems to me that it is very rare, according to my recollection that people are not prejudiced against alum. There may be people who have been using alum in their baking powder without knowing it, but when you talk with them about it, and it is brought to their attention, they are certainly prejudiced against it.

Q. All you can say is that you have talked with a good many people—— A. For the last twenty years.

Q. You have not had this matter particularly on your mind, you have not concerned yourself particularly about it? A. Only at times.

Q. And you have talked with people but you have not made any effort to ascertain whether there is a popular prejudice? A. No, I have made no active canvas for that purpose.

Q. You can say that a great many people that you have talked with are prejudiced against alum, that is all that you can say on that subject, I suppose. Dou you know of any well ascertained case where a person has been diseased, made diseased by the use of alum baking powder? A. No, and I think it would be very odd if I did, it would be very hard to trace it to such a thing as that. People, when they feel indigestion, think of the bread if it has been visibly heavy, sour, or anything of that kind, they may trace it to the bread, but this is invisible, their attention is not drawn to baking powder in any way, they don't think of it, and it seems to me to be extremely difficult and unnatural that people should trace it to such a cause, even though it might be the direct cause of the malady.

Q. After you have gotten through your argument for the plaintiff we will proceed.

Mr. Cunningham: Pardon me, Your Honor, I must object to counsel putting it that way, the witness has a right to explain his answer.

Mr. Seddon: He has not added any other fact or opinion to the case.

Mr. Cunningham: I object to my learned friend characterizing the statement of the witness in that way, I submit it is not fair treatment of the witness.

The Court: This entire branch of the inquiry is a matter that the witness does not pretend to have any expert knowledge on, or knowledge that is not possessed by ordinary people, and it is useless to interrogate him further on that point. I know the general state of affairs in that direction as well as the witness; he only qualifies in one direction.

Mr. Seddon: Your Honor, he stated his opinion as to the consumption of it——

The Court: He stated that because it was not objected to, he simply gave his opinion as any other man without personal knowledge on that point; had objection been made to it by the defense at that time I should have excluded it on the ground that the witness did not pretend to be able to express an expert opinion on that point. I understand what he is called as an expert for, and if the inquiry has gone beyond those limits, it simply encumbers the record in this case and I cannot consider anything beyond what he qualifies himself for.

By Mr. Seddon:

Q. You have made some statement as to what you thought would be the injurious effect of the use of alum baking powders, I believe you said it would retard digestion, that it would get into the circulation, affect the kidneys and probably produce disease there, and you have also undertaken to make some criticism on the amount of food that Dr. Smith gave, and some other criticisms of those physiological experiments; now, I suppose your opinion is entitled to just as much weight as any other individual of good intelligence, and who has received some scientific education, and no more; is that true? A. And has had a good deal of experience in considering evidence and its value to prove a point.

By the Court:

Q. Professor, I should like to ask you a few questions on certain phases of the case. In regard to the process of forming a union between alum and bicarbonate of soda, what office does the oxygen in the water perform? A. In the water that is used to wet them?

Q. Yes. A. It plays no part particularly, the water itself is simply to wet the two substances in order that reaction may take place between them so that the acid sulphate may act upon the carbonic acid and liberate it from the combination with sodium.

Q. Does it play no part in the formation of the hydroxide of aluminum? A. Yes, that is true, and I overlooked that; it is taken up into combination with the alumina to form the hydroxide, that is the water itself, not the oxygen.

Q. Now, the operation of combining these two substances so as to liberate the carbon dioxide, is that one that proceeds rapidly or slowly? A. Rapidly at the start, or slowly as the operation goes on and the carbonic acid left is small.

Q. Is its completeness in any wise dependent upon the amount of water used in the process of combining the substances? A. Well, there must be sufficient water to dissolve the alum compound to bring about reaction.

Q. And the supply of water should be maintained until the reaction is complete? A. Yes, sir.

Q. And if the supply of water is not maintained until the reaction is complete, then there will remain in that residue some of the substances in their original forms, undigested? A. Yes, sir.

Q. Now, in your experiment of inclosing the sample of baking powder in the bread, did you determine afterwards whether the complete union of these substances had been formed or not? A. No, I made no determination of that, and did not consider it necessary for this reason, I added sufficient water at the start and gave sufficient time for that reaction to take place as far as it could without the addition of heat in the baking, it was put into the dough in a moist state, so that there was still plenty of water, and the moisture remained more or less with it because even after the bread was baked the bread contained a large amount of moisture, so there could be no possible chance for there being too little water in that case for complete reaction.

Q. Do you recall what quantity of baking powder you enclosed in that sample? A. No, it was not weighed; it was a small quantity.

Q. Was it measured? A. No, it was not.

Q. Could you give me approximately an idea of how much it was? A. It made a bag of approximately the size of a walnut. I desired, of course, while having sufficient of the baking powder to test afterwards, yet not to have so much that it would not be thoroughly within the dough during the whole baking, and would not be subject to a higher temperature than the interior of the loaf.

Q. If this was simply enclosed in a bag by itself without being incorporated in the loaf and in contact with the moisture of the loaf, and put in the interior of this loaf and

subjected to a temperature of 200 degrees, or upwards, isn't it possible that the immediate effect of the heat would be to drive off the moisture very largely before the operation of the combination between the chemicals was complete? A. No, sir; the operation was mainly complete before the bag was made up for insertion in the dough, that was done before it was made up as a bag, and there remained moisture throughout; when it was taken from the loaf it was still quite moist; damp.

Q. And you made no analysis then to determine whether or not the reaction between the soda and the alum was complete? A. No, sir; and I did not consider it necessary; I am satisfied that, after the baking, there was no question about it being complete.

Q. However, you could not say that as a matter of absolute determination? A. No, because I made no determination; but I am very sure that it was complete.

Q. How did you ascertain that of the resulting compound taken from that bag after the process of baking there was 3 per cent., 3.2 per cent. of alumina present? A. I made the analysis; I made the direct determination.

Q. Then in what form that alumina existed in this residue you did not determine as a matter of actuality, only theoretically? A. No, that could not be directly determined, the condition in which it was, but it was so that the alumina itself was determined, and from that it was a matter of simple calculation the amount of aluminum hydroxide that that amount of alumina represented, aluminum hydroxide being the condition in which the alumina was.

Q. Why do you say it was in the form of aluminum hydroxide? A. Because that is a result of the complete reaction.

Q. In other words that would be theoretically the substances present? A. Yes, sir.

Q. If that reaction were not complete then some portion of the resultant would have been free alum, wouldn't it? A. Yes, sir.

Q. And if that had been the case then the treatment of the substance with the solution of hydrochloric acid of .25 per cent. would result in dissolving first the free alum, wouldn't it? A. Yes, sir; that is very soluble.

Q. And if free alum had been present in that mass then your test would have resulted in the discovery of that as the substance digested, and would not necessarily indicate the digestion or absorption of the hydrate? A. As a result of my analysis?

Q. Yes, as the result of your experiment. A. The result of that experiment was that I found a certain amount as the total amount of alumina.

Q. By the hydrochloric acid treatment you determined that 62 1-3 per cent. of that was digestible in a solution of the acid? A. Yes, sir.

Q. Now, what was free alum in the substance that you treated then, that would have affected the integrity of the conclusion that you reached as the result of the digestibility of the hydrate in this acid solution? A. Well, the alum, if there had been any present, would have been all dissolved, and as much of the aluminum hydrate as is soluble in such a solution, the determination I made in that case was also of the alumina, I did not determine the condition in which it was in there, I assumed that.

Q. If, for any reason, the reaction had not been complete, although you presumed that it was, yet the fact that reaction might not have been complete would affect that conclusion? A. It would slightly affect it, yes, sir; if, for instance, taking an extreme illustration, if none of the reaction had taken place and it had all been there as alum, under the circumstances I certainly should have gotten all the aluminum, I would have gotten 100 per cent. extracted, and, to the extent to which alum was present, with any aluminum hydroxide, that would affect, of course, any conclusion I would draw as to the solubility of what I took to be aluminum hydroxide in the substance.

Q. Now, another question occurs to me; is the quantity of hydroxide formed during this reaction dependent in any wise on the rapidity with which the reaction takes place? A. No, sir; only upon the completeness of the action between elements.

Q. If the reaction is complete, then the result will be no residuum of hydroxide? A. No, you mean in the reaction in the baking powder when wet?

Q. Yes. A. If the reaction is complete all the alu-

mina will be in the form of hydroxide whether that reaction takes a longer or shorter time to complete.

At this point the court adjourned the further hearing of the case until 12 m. February 14th, 1900.

On February 14th, 1900, the court met and the hearing of the case was resumed as follows:

WILLIAM G. MOORE, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham:

Q. Please state your name in full. A. William G. Moore.

Q. You reside in the city of St. Louis? A. Yes, sir.

Q. You are a general practitioner of medicine? A. Yes, sir.

Q. How long have you been a practitioner of medicine? A. Twenty-two years.

Q. Do you hold any office as lecturer or instructor in any medical institutions of the city? A. Yes, sir; the chair of the practice of medicine in the Beaumont Hospital Medical college.

Q. In your practice of medicine I suppose you have from time to time to treat patients of all ages and conditions? A. Yes, sir.

Q. The usually robust as well as those who are of infirm or feeble constitutions? A. Yes, sir.

Q. The question which I will ask you will concern your opinion as to the healthfulness and safety on the one hand or the unhealthfulness and danger on the other of using alum in the preparation of food, either in the food directly or in baking powders for the preparation of food. I will ask you to please state whether or not alum is sometimes used as a medicine? A. Yes, sir.

Q. What is the medicinal dose of alum? A. About three to ten grains.

Q. If alum be administered in small doses of about that amount, given three times a day for a protracted period, will you please state whether or not in your opinion any unfavorable results are likely to follow? A. I think they would; yes, sir.

Q. And what in general terms would be the nature of those results? A. The results that are produced by all gastro-intestinal irritants, namely, irritation of the mucous membrane, with catarrhal conditions resulting and interference with digestion and absorption.

Q. Would it in any way affect constipation? A. I believe it would; I know it would.

Q. Producing or preventing constipation? A. It would produce constipation in a large mapority of cases.

Q. Upon what would that depend, whether it did or did not? A. There is a very relaxed condition to be found in some persons, with them it might not produce it, but in the ordinary man or woman or child it would produce it.

Q. I will ask you whether in your opinion the catarrh or pathologic condition of the digestive tract would favor the production of the injurious effects? A. Undoubtedly.

Q. What have you to say about invalids and weakly constituted persons and children in that regard? A. They would naturally be more susceptible than others.

Q. What is the local effect of alum? A. It is an astringent locally and an irritant and in some cases an escharotic.

Q. What is the meaning of that word? A. It destroys tissue, burns it away.

Q. Is there any marked difference, physiological difference, between the different salts of alum, the sulphate, hydrate or hydroxide? A. Not that I know of; I do not know of any marked difference in the various salts.

Q. What do you say is the action of alum on the mucous membrane of the stomach? A. It contracts the capillaries and afterwards produces an irritation and dilatation.

Q. What, in your opinion, is the action of alum on the gastric juice? A. Being an astringent it would naturally diminish the flow of gastric juice.

Q. What is the action of alumina hydrate on gastric juice in your opinion? A. It does not differ materially from the other conditions.

Q. If the ingestion of alumina hydrate be frequently repeated in various doses on different individuals, what, in your opinion, is likely to occur? A. I think there would be injurious results, catarrhal conditions, indigestion and constipation.

Q. Are there any salts of alumina that are easily soluble in acids such as occur in the human stomach? A. They are supposed to be the lactates and hydrates.

Q. Is lactic acid in your opinion found in the stomach during normal digestion? A. In the earlier stages it is said to be found; yes, sir.

Q. What reasons have you for assuming that such soluble alumina salts as lactate are likely to be absorbed and have an injurious effect on the system? A. Because in the experiments of Siem, Orfield and Bartolow they have been found in the kidneys, in the liver and in the urine.

Q. Suppose that the reaction of the chemicals upon each other, I mean the chemicals used in the manufacture of alum baking powders, which are alum as the acid re-agent, and bicarbonate of soda as the other, suppose that that reaction is not complete and there should remain a small quantity of alum, say five grains or less, after the reaction, in a loaf of bread, would you consider it possible that some individuals would not be injuriously affected by eating such bread for a period of months or years? A. I think they would be; yes, sir.

Q. Now, in your opinion, would the unwholesome effects of such bread be immediately manifest and unequivocal or on the other hand do you think it is likely that a long time might elapse before the disorder of the stomach and of the general organism might declare itself by setting up the positive symptoms? A. According to the susceptibility of one stomach or another it might require quite a time.

Q. Do you know of examples that prove the insidiousness or obscurity of the action of drugs that are unquestionably poisonous when taken into the system? A. Yes, sir.

Q. For instance—— A. Lead is one of the most

suggestive; lead poisoning; arsenic and copper belong to the same.

By the Court:

Q. Those are what are known as cumulative poisons? A. Cumulative poisons; yes, sir.

By Mr. Cunningham:

Q. What can you say, if you know anything, about the hydrate of aluminum being dissolved in alkaline saliva? A. There is nothing contrary to the fact that it might be.

Q. Is it contrary to any physiological law or reasoning that you know of that the hydrate of aluminum in some combination might be dissolved in the intestinal secretions and thus pass into the circulation? A. It is not.

Q. What ailment, if you are going to speak generally, would you say is the most prevailing or prevalent among the people of this country? A. Troubles of the intestinal tract, dyspepsia and constipation; constipation especially.

Q. And will you please say upon what facts or observation you base that opinion? A. Clinical observation, the record of lectures and the general expression among people and the amount of laxatives and purgatives that are constantly sold to the public.

Q. What sort of medicines do you say are most frequently dispensed at hospitals and drug stores? A. I think, take the year around, that laxative will be in the ascendant.

Q. Supposing that constipation or dyspepsia may result from long administration of alum compounds for medicinal purposes, what do you say as to it being in your opinion probable that the same result might follow the habitual use of food containing aluminum in some of its forms? A. I think the same conditions would obtain.

Q. Will you say whether or not in your opinion this use of alum, I mean in food, might be responsible for many cases of so-called nervous dyspepsia? A. It would look feasible to me that all those things have a connection, that if a person were given those things that produce indigestion and prostration it would produce nervous dyspepsia possibly.

Q. What do you say as to the possibility that such use of alum in food may be or may be not a factor in what may

be called the American nervousness or neurosthenia? A. I believe that anything that disturbs the digestion, the elimination or absorption is responsible for neurosthenia in some form or another; I think it the basis of that condition.

By the Court:

Q. Climatic conditions have a great deal to do with it? A. I am not prepared to say as to that. We see it where men are engaged in certain occupations.

Q. May alum have a demonstrable effect? A. Yes, sir.

Q. Under what conditions? A. The amount administered would be the determining factor.

Q. What are the pathologic changes of the system produced by alum? A. The same as with all gastro-enteritic troubles; you have gastro-enteritis.

Q. Do you know of any recorded cases of death resulting from alum poisoning? A. I think there are half a dozen or more.

Q. What would you say was a dangerous dose of alum? A. A dangerous dose?

Q. Yes. A. An ounce.

Q. Then I will ask you whether you would or would not consider it safe practice to give a patient two tablespoonfuls of alum, and, if no result were obtained or from that by way of vomiting or purging, to repeat the dose? A. I think it would be a dangerous experiment.

Q. I will ask you whether you would consider it harmless for a person to take anything which would daily produce vomiting or purging of that person? A. I would consider it extremely harmful; never harmless.

Q. It has been stated that alum may be administered in all cases where subnitrate of bismuth might be administered; I will ask you what is the result of the use of subnitrate of bismuth and whether or not there is any danger from the administration of subnitrate of bismuth? A. I think it is a very much abused remedy; I think there is danger in excessive use of it, I am sure there is.

Q. What fact do you predicate that opinion upon; have you seen any? A. One thing comes to me as squarely to the point, that was a case in the Blockley hospital in

Philadelphia in which a man had taken large doses of subnitrate of bismuth for a period of years or months, I have forgotten which, over quite a period, for what he supposed was sour stomach, or dyspesia; he died of enteritis, gastro-enteritis and on dissection vast masses of bismuth were found in the folds of the lower stomach, and they had produced a gangrenous condition around that part. When a person sees a thing of that kind he does not forget it.

By the Court:

Q. What connection has that with this case? A. As I understand it the assertion has been made that alum is not any more harmful than subnitrate of bismuth.

The Court: I will not range over the face of the earth if somebody did make that statement at some time, I do not know that it has any bearing on this case. If a man said the moon was white I do not know that we would go into a spectrum analysis to see whether it was or was not.

Mr. Cunningham: It is impossible for me to say what would be the effect on the mind of the Court of any evidence. Dr. Atwood said it was as safe as subnitrate of bismuth. It is in rebuttal of that testimony that the question is asked, that is my justification of the question.

The Court: I do not care about investigating a fugitive statement of that kind.

Mr. Cunningham: It is impossible for me to assume that the Court will or will not give weight to certain testimony and I am meeting it.

Mr. Seddon: You brought it out on cross-examination and you are contradicting my witness on collateral matter brought out on cross-examination.

The Court: We will endeavor to keep the inquiry within limits. I have sat eight days in the case now and so far as the amount of testimony produced, it might have been finished in one day. There has been entirely too much testimony taken in the case.

By Mr. Cunningham:

Q. What is true of the teaching of the practice of medicine in regard to the employment of drugs that are known to produce on certain individuals untoward effects or supposed to do so? A. They should be administered in small doses and any effects carefully observed. Idiosyncrasies are likely to develop in individuals where you cannot foresee them.

Q. What, so far as you know, and if you do not, please so state, is the preponderating opinion of the medical profession as to the harmlessness or in-ocuousness of alum used in food? A. I think it is against the use of alum in food.

Q. And I will ask you what, if you know, is the prevailing opinion in the medical profession about the use of bread prepared with alum baking powder? A. I think the opinion is against it.

Q. Have you read the testimony of Dr. Ernest E. Smith in this case? A. I do not know that I have.

Q. I will ask you whether you consider it safe in any case to prescribe or advise the use of baking powder containing alum in the preparation of human food? A. I should be against it.

Cross Examination.

By Mr. Seddon:

Q. When was your attention first called to this case? A. About a week or ten days ago, a week ago, possibly not longer than five or six days ago.

Q. Did you study it up then? A. I looked up the subject, somewhat; yes, sir.

Q. I suppose you did that at the request of some one interested in the case? A. I did not; no, sir.

Q. What caused you to look it up? A. Simply because I was told I was wanted as a witness.

Q. Then you did at the suggestion of someone interested in the case? A. Yes, sir; or I would not have known anything about it.

Q. Who? A. Dr. Bremer asked me about it.

Q. Asked you to qualify yourself and testify here? A. Yes, sir; Dr. Bremer asked me a very fair question over the telephone first.

Q. I do not mean to say that you have done anything unfair, but if you want to say anything, go ahead, but do not do it on that imputation. A. It was simply in answer to your suggestion that I had been here at some one's solicitation. He asked me what my opinion was about the use of baking powders in bread, before he had said another word, before I knew what he was after. That is all I have to say.

Q. I do not wish to ask you what you have been paid, but I suppose you have been paid to attend court and testify? A. I have not been paid.

Q. Do you expect to be paid? A. If it is the custom. The times I have been a witness, I have never been paid.

Q. What? A. In all the times I have been a witness I have never been paid.

Q. Do you expect to be paid? A. If it is the custom of the courts to pay for such cases, yes.

Q. Are you a general practitioner? A. I am.

Q. You have no specialty? A. No, sir.

Q. Have you paid any special attention to what is known as the physiological side of medicine? A. No, sir.

Q. You have not made any experiments yourself with reference to the influence of alum and alumina compounds on the human system? A. I have not.

Q. All of your knowledge is taken from your general learning and medical science? A. That is true; yes, sir.

Q. Now, you said there was no difference between the therapeutic effects of alum, crystalline alum, and the salts of alumina, did you not? A. No, I did not say that, I said so far as I knew there was little or no difference.

Q. I do not suppose you would be able to say positively? A. I would not.

Q. Only so far as you know? A. So far as I know.

Q. When you speak then of the effects of alum on the human organism as you have described it, you spoke of cases of the administration of alum pure, did you not? A. Yes, sir; alum salts.

Q. That is to say, you know the difference, I suppose, chemically, between alum, crystalline alum, and what is known as the salts of aluminum, do you not? A. Yes, sir.

Q. What, now, do you refer to when you speak of these results as coming from the administration of pure free

crystalized alum or aluminum salt? A. We generally prescribe alum and that which is dispensed as an alumina salt.

Q. What form of alumina salt? A. Crystalline alum powdered.

Q. We do not call it chemically a salt? A. It is crystalline alum.

Q. Are you able to say exactly what physiological effects it has? The alum that you speak of, when taken into the stomach? A. No, sir; I am not.

Q. You spoke of it being absorbed and going into the circulation and being eliminated by the kidneys and appearing in the urine? A. Yes, sir.

Q. Do you think that is admitted by all the writers upon this subject? A. I do not know that it is; no, sir.

Q. Don't you know that there are some quite distinguished experts on food and the science of food that not only do not admit it, but deny it to be a fact? A. That is true; yes sir.

Q. You have never made any experiments to determine whether or not the alum taken pure in the way you spoke of diminishes the flow of the gastric juice? A. I have never made any such experiments; no, sir.

Q. Can you recall now any standard medical book in which such experiments have been recorded or is that your inference from the nature of the article? A. It is just my knowledge of the astringency of the article and supposing it will act in the stomach as an astringent.

Q. Because it is an astringent, you assume it would? A. That it would astringe; yes, sir.

Q. Have you ever observed yourself in practice any case where a constant administration of alum in small doses has produced dyspepsia or constipation or irritation of the intestinal canal? A. Repeat your question.

Question read. A. I have never given alum constantly over any great period.

Q. You infer that then from your general scientific and medical knowledge and from the nature of the drug, do you not? A. Yes, sir.

Q. Do you know A. Wynter Blyth, whom witnesses have testified is an acknowledged authority on food and toxic elements? A. No, sir.

Q. You do not know anything about him? A. I know who he is.

Q. Don't you know that he is an acknowledged authority? A. I do; yes, sir.

Q. Do you think that his statement and conclusion after discussing the subject that alum taken in small doses with food is not injurious to health—— A. No, I don't believe his statement.

Q. Wouldn't you consider it entitled to considerable respect if he made such a statement? A. I would, but I don't believe it.

Q. You do not believe the statement or the conclusion? A. I do not believe the conclusion.

Q. You speak of lactic and hydrate acid, I suppose I did not get you accurate, you must have meant, hydrochloric acid in the stomach? A. I was not asked that, I was asked if there was lactic acid normally in the stomach.

Q. I do not want to get you wrong, I thought you said hydrate acid? A. I do not know any hydrate acid.

Q. I suppose that is a mistake. Do you know of your own knowledge, or I might ask you from your scientific knowledge, what is the exact condition of the element that comes from alum used in baking powder when bread is cooked with baking powder, what combination is formed there? A. No, I do not know of my own knowledge the exact condition.

Q. Do you know from your scientific knowledge? A. I do not.

Q. You do not know how it exists in bread, in combination with what elements or in what form? A. I understand it exists in the gelatinous form of the hydrate.

Q. But you do not know? A. I do not know from experiment at all.

Q. You do not know whether it may exist in an insoluble compound, with gluten for instance? A. No, sir.

Q. Or with mucidin? A. I do not.

Q. Or any other compound supposed to be in wheat? A. No, sir.

Q. And your answer you give on the assumption that it goes into the stomach practically in the same manner as if it were administered as a medicine, do you not? A. Either

that or it is formed in the stomach, re-formed as alum in the stomach.

Q. That is your idea? A. Alum salts.

Q. The medicine spoken of being given therapeutically in practice? A. Yes, sir; or any form of alum.

Q. You spoke of nervous dyspepsia or some other nervous diseases, what was it?

Mr. Cunningham: Neurasthenia.

By Mr. Seddon:

Q. Neurosthenia as being a largely prevalent complaint in this country; is it a fact that those complaints exist more largely in the lower and middle classes or in the higher classes of the city? A. I should say in the middle classes.

Q. You say in the middle classes? A. Yes, sir.

Q. What do you mean by middle classes? I think it is improper to speak of classes in America. A. I think so too.

Q. Therefore I ask you. A. I mean the general mercantile and business world, men who are engaged in affairs of every-day life, men who work for a living with their brains or hands.

Q. I ask you whether it is prevalent amongst people who work with their hands or people who work with their brains? A. It is more prevalent among people who work with their brains.

Q. Is it not supposed generally by physicians that it is largely the result of overtaxing the brain and nervous system by too close application and worry over affairs? A. That is a prevalent opinion; yes, sir.

Q. That is the prevalent opinion? A. That is a prevalent opinion.

Q. By higher classes I suppose you mean the classes of leisure? A. That is what I mean.

Q. You said that there were half a dozen cases of deaths that had been reported from taking very large doses of alum, you mean this crystalline alum which you speak of as alum salt? A. I could not say what had been administered, because in the reports of the cases they were given as deaths resulting from alum.

Q. You say about half a dozen cases? A. Approximately, yes.

Q. Well, there is hardly anything from which death has not resulted from taking excessive amounts, is there, doctor? A. Well, I do not think I could agree with you there, hardly anything.

Q. There are very few things; I suppose if you were to abuse yourself by taking sodium chloride, common table salt, you might produce death? A. Of course, you could; with enough salt, a man might die.

Q. You would produce disorders of the intestinal canal and other internal complaints by the constant use of it? A. Undoubtedly; yes, sir. I do not wish to be quoted as saying that I have ever known of death or injury coming from common table salt. If a man were fed on salt he might die as a result of the diet.

Q. I want to show you the general principle. Men have sometimes been killed by an overdose of whisky? A. I have heard of such cases, I have never seen one.

Q. You spoke of an opinion against the use of bread cooked with alum baking powder; what do you mean by that, I don't quite understand you? A. What did I mean by what?

Q. You said there was an opinion against the use of bread cooked with alum baking powder. A. The general impression gained from conversation with laymen and physicians is against alum as a poison, they believe it to be injurious and consequently want to avoid an injurious article, that is what I mean.

Q. You do not mean to say that you have attempted to make any investigation as to what laymen think upon it as a whole, do you? A. I do not mean to say any such thing. I have had a great deal to do with filtration and the subject of water and that quite recently, and all laymen who speak of it speak of being opposed to it from alum being used in it. My opinion has existed for some time.

Q. You have not discussed with them the question of baking powder much? A. No, I have not; not with a single man.

Q. What? A. With no one.

Q. Do you or do you not know that for a hundred years back alum has been used in various forms in the prepar-

ation of various foods, for instance in pickles? A. I know that alum has been used in making pickles; I know that pickles are generally considered very indigestible; I do not know that for a hundred years it has been the case at all.

Q. But have you ever in your own mind attributed the indigestibility of pickles to the use of alum in them? A. No, I have never, but as I think of it I can understand readily why it would be a disturbing element in them.

Q. In preserving fruit it has been the common practice for a great many years to put some alum in the jar? A. I really do not know whether it has.

Q. Did you ever hear of Mrs. Rorer as an authority on cooking? A. I cannot recall the fact if I ever did.

Q. Then I will not ask you any question about her. Have you ever seen any case in any standard medical book, recorded in any standard book, where a patient was supposed to have been injured and treated for the injury because of the eating of bread cooked with alum powder? A. No, sir.

Q. Have you ever in your own practice come across a case where you supposed and diagnosed the case of an injury to the digestive organs as resulting from use of bread cooked with alum baking powder? A. I have never diagnosed such a case, but I frequently inquire into the baking powder used, and ask them to avoid them containing alum, if possible, because I believe in its injurious effects.

Q. Do you know whether or not in any medical book or standard authority any case has been recorded as having been developed or caused by the use of bread cooked with alum baking powder? A. No, I cannot recall any such.

Q. Then, I suppose, your opinion as to the injuriousness of the use of alum in baking powders is, I may say, generally theoretical, that is to say, derived from a course of reasoning upon what you consider the nature of alum? A. Yes, sir; my conception of the nature of alum and its effects on the stomach and intestinal canal is the basis of my opinion.

Q. Have you prescribed alumina hydroxide? A. No, sir.

Q. You do not know what its effect would be then, do you? A. No, sir.

At this point the Court took a recess until 2:15 p. m.

After recess at 2:15 p. m. the Court resumed the hearing of the case as follows:

ALONSO R. KIEFFER, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham:

Q. Please state your full name. A. Alonzo R. Kieffer.

Q. You reside in St. Louis? A. Yes, sir.

Q. Are you a practitioner of medicine in this city? A. Yes, sir.

Q. With what institutions, if any, of learning are you connected? A. Barnes Medical college.

Q. What is your office or what are your duties in that institution? A. Professor of anatomy.

Q. In your practice do you have occasion to treat patients of all ages and conditions in life and habit, I mean by that, persons of robust constitution and persons of feeble or impaired constitutions, and children and grown persons? A. Yes, sir.

Q. Is alum ever used as a medicine or medicinal agent? A. Yes, sir.

Q. What is a medicinal dose of alum? A. From two or three to ten grains.

Q. If it is administered in small doses, say from one to ten grains, given three times a day for a protracted period, do you say that any unfavorable results are likely to follow or not? A. Yes, sir; I believe they will.

Q. What results in a general way do you say would follow from such continuous use? A. Disturb digestion and produce constipation.

Q. Do you think that a catarrhal or other pathological condition of the digestion would favor or impede such effects of the drug? A. It would favor it.

Q. Have you any opinion as to the healthfulness and safety or unhealthfulness and danger of the habitual use of

alum in human food, and, if so, please state what your opinion is? A. I believe it to be detrimental to the health of the individual.

Q. I will ask you whether or not your opinion is the same, or whether your opinion is different as to the healthfulness and safety of using alum, not directly putting it into the food, but putting it into a baking powder to be used in the preparation of food, what do you think of that, as to its being healthful and safe, or unhealthful and unsafe? A. I think it would be an unsafe experiment.

Cross Examination.

By Mr. Seddon:

Q. Doctor, who first called your attention to this case? A. Dr. Bremer.

Q. What did he say to you about it? A. I met him down at the medical society three or four weeks ago and he asked me what I thought about using alum—alum baking powder, I believe, is the way he asked me, I told him I thought it would be prejudicial to the health of those using it, and he then asked if I would be willing to testify to that and I told him I would.

Q. And then you were communicated with by the attorney for the State and as a result of that you came to testify? A. No, sir; the attorneys did not communicate with me.

Q. Who communicated with you, how did you happen to come down to the court? A. Well, the understanding was that Dr. Bremer told me I would be needed.

Q. It was Dr. Bremer that invited you down to court, or asked you to come down to court to testify? A. Yes, sir; I met the attorney since, but I have no recollection that he said anything about my coming down.

Q. Have you paid any especial attention to the physiological side of medical science? A. Not more than a general practitioner is supposed to pay.

Q. You are not a specialist in any way, you are just a general practitioner, are you not, doctor? A. Yes, sir.

Q. When you speak of the effect of alum on the human organism you speak of the administration of what is known in the drug stores as alum, do you not? A. Yes, sir.

Q. What form is that alum in, do you know? A. Well, it was kept in different forms, common alum is sulphate of alumina combined with the sulphate of soda.

Q. What? A. It is a combination of the sulphate of alumina and sodium, or it may be potassium, or ammonia sulphate.

Q. Well, it is what is known as crystalline alum? A. Yes, sir.

Q. You speak of the doses of alum as being from 3 to 10 grains? A. Yes, sir.

Q. Did you ever know of as much as forty grains being given? A. Yes, sir.

Q. Then the doses are from 3 grains to 40 grains, are they not? A. Well, you can state that, yes, sir; I was speaking with especial reference to the size of the doses I used myself.

Q. Now, have you ever observed the effects of giving small doses of from one to ten grains during a protracted period, three times a day? A. No, sir.

Q. You draw your inference from what you think or you know of the action of alum, do you not, as to what effect it would have? A. Yes, sir.

Q. Do you know of any experiments that have been made by any one to ascertain exactly what effect it would have? A. Yes, sir; I have read of them.

Q. In what book? A. I read of the results of the action of alum in Witthaus & Becker's Medical Jurisprudence.

Q. What do they say about it? A. They reported six fatal cases in that book.

Q. Did it state the amount of alum that was given in that, we read it here the other day, I believe, that same extract? A. I don't remember whether it was in every case or not, but it was large doses.

Q. Don't you remember that it was said that the deaths had occurred by the administration of very large doses of alum, and he cites three cases? A. There were six cases cited in the report that I read, the doses were large. I don't recollect the dose.

Q. You did not understand my question, I am speaking of cases where alum was administered as a drug in doses of from one to three grains, three times a day during a protracted period, I ask you whether you have ever made any such experiments yourself and you say you have not? A. No, sir.

Q. Now, I want to know whether any such experiments to your knowledge have been recorded in any standard medical work? A. No, sir; I don't know of any.

Q. Well, if you were to administer some other medicine, say Rochelle Salts, continuously, for a considerable period of time, it would have a deleterious effect if administered three times a day? A. I believe it would.

Q. The National Dispensatory by Stille & M——— is a standard authority, isn't it? A. Why, I think it is.

Q. Don't you know it is? A. I am not positive, no, sir; please repeat the name of the work.

Q. Stille & M——— National Dispensatory? A. I am not familiar with the work, therefore I have no opinion in the matter.

Q. Well, I will ask you for an opinion from your own individual knowledge——

Mr. Cunningham. Judge, what edition is that?

Mr. Seddon: 1884, third edition.

Q. What do you think of this statement, "in small and repeated doses it renders the urine alkaline?" A. I think it would.

Q. Take a piece of bread that has been cooked with an alum baking powder, do you know in what form the element from the alum exists in that bread? A. No, sir; I do not.

Q. When that bread is taken into the stomach, do you know what are the actions that take place in the stomach, the physiological actions? A. You mean on the part of the stomach?

Q. In the stomach? A. The secretion of gastric juice would be the result.

Q. No; I say with these elements that are in the bread, assuming a case where a person in normal health takes the baking powder into the stomach and digests it, do you know

what combinations the alum element makes with the other elements of the stomach, compounds in the stomach, in the digestive? A. That would depend on the condition of the stomach.

Q. I am speaking of the physiological action, exactly how the various elements combine together? A. Now, I understood when I answered the other question that you wanted me to speak from my own knowledge as to the form in which the aluminum existed in the bread, I answered that I did not know, I meant from my own personal knowledge. Now, from the description given in standard works it is supposed to exist in the form of hydroxide of aluminum; the reaction between the drugs would depend upon the acids that were in the stomach at the time the bread was there; the supposition is by physiologists that at an earlier stage lactic acid exists and at a later stage hydrochloric acid. Now, what might take place might be the formation of the lactate alumina, but whether that takes place, from my own experiments and knowledge, of course, I could not state.

Q. It is a physiological problem that you would not feel, as a general practitioner, qualified to pass upon, would you? A. No, sir; I would not, only from the common information that doctors make use of.

Q. Do you know the medicinal action and uses of hydrate of alumina? A. They are supposed to be similar to that of alum, except milder.

Q. Supposed to be; have you ever administered it? A. No, sir.

Q. What is your authority for saying that it is supposed to be the same as alum except milder? A. I am not positive that I can give it, I have seen that statement recently, but I cannot say where I saw it.

Q. You cannot cite any authority, can you? A. No, sir; I wouldn't like to attempt to do it.

Q. Did you say that alum was an astringent? A. Yes, sir.

Q. Is the hydrate of aluminum an astringent? A. It is supposed to be mildly so, yes, sir; or there are less astringent results from it then from the compound alum after the administration of it.

Q. Don't you know, as a medical man, that it is absorbent and protective? A. Yes, sir; if it would remain as a hydroxide in the stomach.

Q. Well, when the books give the medicinal action of hydrate of alumina, they gave it as it affects the person, don't they? A. Supposed to, yes sir.

Q. Well, what do you think of the statement from the National Dispensatory of Stille & M , that it is absorbent and protective, and, like the oxide of bismuth, it is antacid? A. I think that is correct.

Q. Then it differs from alum in its action, does it not? A. If it would remain; yes, sir, as a hydroxide of aluminum.

Q. I am speaking of the medicinal effect when it was taken, that is its effect, isn't it? A. Yes, sir.

Q. Now, you say alum is an astringent and excitant? A. An astringent in small doses, in large doses an irritant and in still larger doses it would be an escharotic.

Q. You have no authority, either in your own experiments or any other experiments in any standard book that you can cite here, that alum is cumulative in the system, have you? A. No, sir.

Q. You don't know, as a medical scientific man, what combination the alum element used in baking powder in the preparation of food forms with the compound existing in the flour? A. No, sir.

Q. You don't know whether they are soluble or insoluble, do you? A. No, sir.

Q. Their solubility or insolubility would, of course, differentiate them from the pure alum, wouldn't it? A. Yes, sir.

Q. Then your idea, or I mean your opinion expressed, that the use of baking powder, I mean the use of bread prepared and cooked with alum baking powder, is injurious to mankind, is drawn from what you know as a scientific man of the administration of pure alum, isn't it? A. Please repeat that question, the question is so long.

(Question read). A. Yes, sir.

Q. Have you given much attention to the subject of indigestion and dyspepsia? A. Not especially, the same as a general practitioner is supposed to.

Q. Then, I will ask you whether in your experience as a physician you have ever had a patient whose diseased con-

dition of the digestive system could be attributed, either in whole or in part, to the use of alum baking powder in the preparation of food? A. I never made a diagnosis, no, sir, not at all; but, like all other doctors, we always recommend to our patient against the use of those, and believe that they may have been a part of the cause, or that they are the cause; I never was able to make a diagnosis that this or that case of indigestion depended on this and nothing else.

Q. Have you ever, in your experience as a physician, been ready to attribute any functional disorder or diseased condition of your patient to the use of alum baking powder in food? A. No, sir.

Q. Dr. Flint, in his testimony, stated that he had large experience in hospitals in the treatment of various diseases, and he stated as a fact that he found that there was rarely any dyspepsia or functional disorder of the digestion amongst the poor, that it was confined mostly to the richer people; what is your observation with reference to that? A. I think he is mistaken, I have never found it that way in my observation, that is I mean I don't think his statement applies to the cases that have occurred in my practice; I have never differentiated between the rich and the poor as to constipation or indigestion, or otherwise.

Redirect Examination.

By Mr. Cunningham:

Q. What is you opinion as to the prevalence of dyspepsia and constipation in the community? A. It is exceedingly prevalent, the most prevalent of all ailments.

By the Court:

Q. Is this condition one of recent origin, or has it existed for any length of time, as far as you know from observation or medical works? A. It has always existed since I have been practicing medicine, such disorders, I believe the general sentiment, drawn from observation and association with other doctors, is that these troubles are tending to increase, indigestion is more common than it used to be; it has always been exceedingly common.

By Mr. Seddon:

Q. That is a general impression, you have not ascertained that in any way? A. I have no figures, no statistics on the question; no, sir.

Q. You have never seen that conclusion drawn in any standard medical work, have you?

Mr. Cunningham: Do you mean the prevalence of dyspepsia?

Mr. Seddon: No, the increase of it.

The Witness: No, sir.

JAMES A. CLOSE, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham:

Q. Please state your name in full. A. James A. Close.

Q. Your residence? A. 3509 Olive Sreet, St. Louis.

Q. What is your profession? A. Practitioner of medicine, physician.

Q. What other employment or offices do you hold, if any, besides that of practitioner of medicine? A. I hold the chair of Professor of Pathology in the Barnes Medical College of this city.

Q. Is alum recognized as a medicine or a medicinal agent? A. Yes, sir; it is.

Q. And what do you say are the usual and proper doses of alum to give? A. To the adult from 5 to 10 grains, I thould think usually from 5 to 10 grains.

Q. And to infants, or persons other than adults? A. Well, proportionately, I administer from a half a grain to two or three grains of alum.

Q. Now, what is the effect of that medicine when so given? A. Alum is classified as an astringent, it contracts the tissues, checks secretions and coagulates the blood firmly when it comes into contact with it, coagulates the blood and checks secretions, it is an astringent.

Q. If administered in small doses such as you have mentioned, say, for a protracted period, are unfavorable results likely to follow? A. Well, I should think they would follow in any case where an astringent was administered continuously if it was absorbed into the blood.

Q. And what, in your opinion, is to be said of the healthfulness or unhealthfulness of the use of alum in human food, day by day? A. Well, I certainly should think that it would be injurious.

Q. What do you say of the use of alum in baking powders to be used in the preparation of food as to the safety and healthfulness of such use? A. Well, that could hardly be answered without some qualifications. If this alum were absorbed into the blood by the patient who ate the bread which was made from the baking powder, I would say that it would be harmful, that will have to be considered; when you ask that general question, "Is alum harmful if used in baking powder?" I would like to know if the alum will reach the blood of the patient who eats the bread, if so, it will be harmful, there is no doubt about that, because it is a continuous administration of an astringent which checks the secretion.

Q. What, if anything, do you know as to the possibility of the alum, or alum constituents, which are put into baking powder, going into the bread and from the bread going into the stomach, what, I ask, do you know as to the possibility of those constituents being absorbed into the circulatory system? A. Well, as I understand the composition of baking powders, alum is always used with some carbonate, or bicarbonate, such as bicarbonate of soda; alum, reacting as an acid, will liberate the carbonic acid gas from the bicarbonate of soda, which causes this lightness of the bread, of course. Now, if the amount of the bicarbonate of soda exactly neutralizes the alum, and this hydrate of alumina is formed, alum will no longer then be in the bread, but as to whether this will be converted, in the stomach, into alum or not, or as to the form in which it reaches the blood, I don't know, and I don't think any one knows that either, and I don't think that is possible owing to certain peculiarities of aluminum salts. In the works of chemistry they are regarded as the most uncertain and unreliable chemical

agents that we have to deal with in chemistry, we don't know what they are going to do, or what combinations they form, therefore, that is exceedingly necessary—is that an answer to this question?

Q. Well, suppose you assume, as a proposition established by the chemists that when the hydroxide goes into the stomach it there comes in contact with other things, such as hydrochloric acid and lactic acid, and perhaps other organic acids, with which it goes into combination, what, if anything, can you say about the possibility of such aluminum compounds being absorbed into the circulation through the walls of the alimentary tract, do you think it is possible that they may be so absorbed? A. I certainly do think it is possible, but here comes the difficulty, that the same aluminum hydrate at one time is soluble in acids, and at another time it is not, and it is the same aluminum hydrate; so there is a difficulty, how is any man going to account for that fact, that the same aluminum hydrate is at one time soluble in acids and at another time not, being the same substance; therefore, whether it enters into combination it is hard to say. Secondly, there is a peculiarity of the aluminum compounds, that they have a powerful attraction for organic matter by which I mean starch and sugar, the constituents of bread, etc., that is whenever this aluminum hydrate is brought into the presence of organic compounds it has such an attraction for them that it forms new combinations, I doubt if they have even been properly studied; they may be soluble and absorbed into the blood, that is quite possible, I think it is certain that they have been absorbed into the blood.

Q. What do you think of the safety or prudence of administering two tablespoonfuls of alum to a patient? A. Well, I would call that an excessive dose.

Mr. Seddon: One moment; Major Cunningham, on what do you base that question?

Mr. Cunningham: The statement of Dr. Atwood, that he gives two tablespoonfuls or more with safety.

Mr. Seddon: That is merely a collateral matter brought out in the attempt to discredit him, you cannot contradict it.

Mr. Cunningham: I submit the question to your Honor.

The Court: As the question has been answered it may stand in the record.

By Mr. Cunningham: Doctor, what, in your observation and according to your knowledge is the extent of the prevalence or non-prevalence of constipation and indigestion among the people? A. Well, it is very prevalent, exceedingly so, we are more frequently consulted by patients suffering from constipation, probably, than by any other classes, I mean to say patients with other diseases, and for constipation itself, where that is the main trouble that we are consulted for it is probably the most frequent condition that we discover in consulting with our patients.

Q. What is your opinion as to the effect upon such patients as suffer from constipation and indigestion; what is the effect upon such patients, I say, by the use of bread baked with alum baking powder? A. Well, as I said before, if that bread contains a soluble astringent like alum it would increase the difficulty, or alumina hydrate, which is also an astringent, if it contained either alumina hydrate or alum it would be an astringent, and given to a patient with constipation it would increase the constipation, according to our knowledge of therapeutics, of medicines.

Cross-examination.

By Mr. Seddon: Who spoke to you first about this case? A. Prof. Potter I think, no, I am not quite sure whether it was Prof. Potter or Dr. Bremer spoke to me about it.

Q. Are you sure that both of them did not speak to you about it? A. Well, I have spoken to Dr. Bremer about the case, yes.

Q. But I mean to say did Dr. Bremer come to you? A. No, it was Prof. Potter that came to me.

Q. Did Dr. Bremer come to see you about it? A. Well, I can't recollect whether he came to my office to see me about this or not, perhaps he did, he came into my office,

but whether he came on that errand or not, I could not swear, positively, he comes frequently to see me.

Q. He spoke to you about being a witness in this case, didn't he? A. Yes, sir.

Q. Did he ask you to come down and testify? A. He didn't ask—whether he asked me or not I could not say, I think Prof. Potter asked me to come down.

Q. You had seen Prof. Potter before you saw Dr. Bremer about this case? A. Yes, sir; I think I did.

Q. I believe you are a general practitioner? A. Yes, sir; I treat nearly all the diseases that come along.

Q. In other words, you have never made a specialty of any particular thing? A. No, sir; not any particular one.

Q. You have not made a specialty of the physiological side of the science of medicine, have you? A. No, sir; not a specialty of it.

Mr. Cunningham: Please wait until counsel has finished his question before you being to answer.

The Witness: All right, sir.

By Mr. Seddon: When you are speaking of the effect of alum on the human organism I suppose you refer to what is usually known as alum in the medical profession? A. That is crystalline alum, yes sir.

Q. Have you ever tried any experiments yourself where you have administered small doses of alum three times a day for any protracted period of time and noticed the effect on the individual? A. I never did.

Q. Do you remember of any recorded experiments of that kind in any standard medical work? A. Not in any standard medical work, I don't think I do.

Q. Then your opinion on that is drawn from your general knowledge of medicine? A. Of medicine, yes sir.

Q. What you would suppose would take effect? A. Yes, sir.

Q. Now, the anhydrate of aluminum, or hydroxide, as some call it, has a different therapeutic effect from crystalline alum? A. The effect is not so powerful, it is an astringent, but it is not so powerful.

Q. Do you know of the National Dispensatory of Stille & M. A. I know the book by reputation, I have not studied it to any extent.

Q. Well, it is considered a standard work? A. Yes, sir; I think it is considered a standard work, yes sir.

Q. What would you say of this statement: "Hydrate of aluminum appears to resemble the oxide of bismuth and also magnesia in its action and uses. Like the former it is absorbent and protective, and like the latter antacid. It is suitable for the treatment of dyspepsia and of diarrhoea when they depend upon an excess of acid in the digestive canal. In Germany it is used in infantile disorders of the stomach and bowels." Is that a correct statement of the medicinal properties of the hydrate of alumina? A. No, from my reading it is not; the United States Dispensatory, our standard authority in this country, differs from that; we consider the United States Dispensatory as the highest authority in the United States; it is an astringent the same as alum is, according to the United States Dispensatory.

Q. Then high authorities seem to differ? A. They do. That could be reconciled in one way; as a dry powder, like flour, scattered over a raw surface it might be used, but internally I would not like to accept the views of Stille & M.

Q. You could not give it externally for a disorder like a diarrhoea, could you? A. No, sir.

Q. So his statement here seems to refer to an internal treatment of it? A. It does.

Q. You say that hydrate of alumina tends to form an insoluble compound with the compound that exists in flour? A. I said it forms compounds with them, it has a powerful affinity for them, a great attraction for them, I don't know whether they are soluble or insoluble, I don't know that I have any knowledge of that fact.

Q. Then I mistook your meaning. Now, you say the harmfulness of the baking powder would depend on the fact whether the alumina element in it was absorbed into the circulation? A. I should think so, whether it is absorbed or not, the alumina.

Q. And I believe you said that nobody had ever ascertained that definitely, you never made any experiment? A. No, sir; and I have never been able to find out, to settle that question, how it gets into the circulation in any form.

Q. In your experience as a physician you have given considerable attention to the subject of indigestion, have you not? A. Oh, certainly, compelled to.

Q. Have you ever had a patient whose diseased condition of the digestive system—suffering from indigestion, which was attributed either wholly or in part to the use of alum baking powder in the preparation of food? A. Oh, I couldn't settle that question at all, I could not decide that; in the vast number of cases where the cause is obscured, it might be baking powder and it might be something else.

Q. You speak of the prevalence of dyspepsia; don't all our tendencies in modern civilization tend to increase indigestion and increase dyspepsia, our mode of life, our haste, our application to business, our neglect of the rules of health, and the hurry to get wealthy, don't all those things tend to increase or cause indigestion and dyspepsia? A. Some of them do, not all of them; our condition of life is far superior to the savage; in many respects, of course, our race for wealth and hurried eating, etc., they do.

Q. I am not speaking of the health we have attained, but the peculiarity of our people, the fact that they suffer from indigestion and dyspepsia a great deal? A. The habits of some do without a doubt, I could not say that would apply generally to everybody though, I would have to be cautious how I made such a sweeping statement as that, that generally our habits—I don't know, we are a nation, probably of dyspeptics, at least other nations say we are, and what causes it is what I want to find out, I am engaged in the investigation of the causes of disease, that is my chair in the school, to find out what causes disease, which is the most difficult branch of science, what causes my stomach to be out of order today, is it the biscuit I ate this morning, or what?

Q. You have not arrived at any conclusion that it is caused by eating bread cooked with alum baking powder, have you? A. Well, I don't know that I would dare say I have arrived at a conclusion, but a very strong suspicion has been caused in my mind that it might be. It is a metal absorbed into the blood, that is admitted by Prof. Flint, and that has been proved, we do know, among other things, that metallic poisons produce the most damaging results on the organs of the body, on the kidneys particularly, and kidney

disease and dyspepsia are closely associated, so it is a metallic poison, being a metal that is introduced into the blood.

LUDWIG BREMER, sworn for the State, testifies as follows:

Direct Examination.

By Mr. Cunningham: Please state your name? A. Ludwig Bremer.

Q. Your residence? A. St. Louis.

Q. What is your business or profession? A. I am a physician.

Q. How long have you practiced medicine? A. About 30 years.

Q. Of what institution of learning are you a graduate, or what institutions of learning have you attended? A. I am a graduate of the St. Louis Medical School, and have studied in Europe at different times duing the last 30 years, Paris, Berlin, Zurich, Strassburg and Leipsic.

Q. What special direction, if any, has your practice taken of late years? A. I am now engaged in the practice of neurology, that means that I treat nervous people not only for their nervous aliments, but I treat their whole system, I treat them as general patients.

Q. Has your attention been at all directed to the use of alum, or compounds of alumina, either when administered as medicines or when used in the preparation of food? A. Yes, sir.

Q. Speaking now of alum as a medicine, for what purposes is alum administered as a medicine? A. Alum is pretty much out of date now as a medicine because of the injurious effects which are generaly attributed to it, but when I was a young practitioner I did give it in doses of from 2 to 10 grains, I remember that I gave it very frequently about 28 or 29 years, or even 30 year ago when I was resident physician of the quarantine hospital, which, at that time was the convalescent station of the city hospital; to 200 or 250 patients I gave alum very frequently and at that time I desisted from giving it because I saw the evil effects it had on the patients in the way of indigestion and constipa-

tion; I can certify to that fact from my own personal knowledge.

Q. What do you say then would be the effect of the administration continuously, day after day, of small doses of alum? A. In the light of my own personal past experience, and from the statements I have read in standard books on the subject, I would say it deranges the digestion, produces chronic catarrh of the stomach, produces constipation and emaciation, and, I may add, when all these symptoms do occur then they have one inevitable consequence, and that is general nervousness.

Q. What would you say as to the difference of effect depending upon the condition of the patient as to sturdiness and robustness of health, or the converse, as to full age or youth? A. All medicines if administered to strong and normal, as far as that expression goes, individuals, have less of a therapeutic or poisonous effect than on the weakly constituted and on children, so alum certainly will affect in smaller doses a certain individual deliteriously, when, perhaps, a stronger person would entirely escape the harmful effects, or, at all events, would not show such effects.

Q. Is alum ever administered in doses larger than you have spoken of being administered by yourself? A. Yes, sir.

Q. And for what purpose? A. For emetic purposes, for the purpose of producing vomiting; for instance, I have administered it myself in laryngeal croup to produce vomit, but I would not use it now because we have a better and more reliable means; neither is sulphate of copper used any more as an emetic because of its possibly dangerous and poisonous effects.

Q. Are there any marked differences between the physiological action of the different salts of aluminum or are those effects of a kindred nature? A. I can answer that question only upon my information that I have gained from reading. According to that and the statement made in Rausbach in the year 1876, the action of aluminous salts are pretty near the same.

Q. Has your observation or experience led you to doubt the correctness of that statement? A. I have never used but two preparations, that is alum as such and the alumina in powder.

Q. You mean the hydroxide? A. The hydroxide in powder form, and I am not quite so certain about the action of the hydroxide, I do not remember any more, but I certainly do know that I have used that for the purposes mentioned, in olden times, some 25 or even 30 years ago.

Q. What is the action of alum on the gastric juice of the stomach, if you know? A. Well, I never made the experiment myself, but reasoning medically and physiologically, being an astringent it contracts the capillaries of the walls of the stomach, the mucous membrane. Contracting the capillaries means a diminished flow of blood, a diminished flow of blood means a diminished flow of the gastric juice, consequently I would say it impedes or impairs the flow of the gastric juice and perhaps it also changes it chemically.

Q. And what is the action of the alum in a hydrate or hydroxide on the gastric juice, if you know? A. Supposing that Rausbach is correct, and that it has also an astringent action which it is true by some is ascribed to impurities and to the admixture of alum, that is claimed, but if Rausbach is true, the action of aluminum hydrate is pretty near the same as that of crystallized alum. I want to state here that all the matters are more or less problematical, that they depend upon reasoning, but what I can reasonably assert is the deleterious action on the stomach of medicinal doses of alum.

Q. If the injection of alumina hydrate be frequently repeated in various doses on different individuals what is likely, in your opinion to occur? A. If it is true, as claimed, that in the stomach there is a reforming of the alum then it has the alum effect. That means constipation, dyspepsia, chronic inflammation of the stomach and catarrh, which is the same thing.

Q. Are there any salts of alumina to your knowledge that are easily soluble in acids or proteids? A. Any salts of alumina that are easily soluble or what?

Q. In the acids of the stomach? A. I know that the gelatinous form of alumina hydrate is easily soluble in lactic acid and acetic acid.

Q. Do lactic and acetic acids ever occur in the process of digestion in the human stomach? A. They occur in the so-called sour stomach. There are lactic, butyric and acetic acids all present. I know from my personal knowledge that in

lactic acid and acetic acid aluminum hydrate is easily soluble, but it is butyric acid that I do not know about because I could not get it.

Q. Now, if hydroxide becomes soluble in the stomach in either lactic or acetic acid, what do you say of the possibility of the absorption of such compound into the system from the alimentary tract? A. The probability is great, not only is there a possibility but the probability is a very great one, that these combinations of alumina are absorbed into the blood. In the first place the experiments of Siem, which, I have read, demonstrate the known irritating quality of lactate of alumina. It can be injected into the blood without producing coagulation, and enter the general circulation where, in the course of time it produces parenchymatoris, nephritis, fatty degeneration of the cells of the liver. Then again, of course, this experiment only proves that when lactate is injected into the circulation it produces certain diseases of the tissues of an inflammatory and degenerative character. That would not mean positively that in some form, supposing lactate of alumina was formed, it was absorbable or easily absorbable, it does not follow from that, but there was an experiment which was made by a German surgeon upon himself when he tested the poisonous or non-poisonous character to obtain a conclusion, who took, I think it was, 20 or 30 grains, I am not positive now of the acetate of alumina, one of the products, which it is very probable are formed in sour stomach from alumina hydrate, and he experienced intense vertigo and ———— condition which lasted several hours. That was an experiment made upon man. Most of the experiments have been made on animals. Of course, an experiment on man is more favorable than experiments on animals, although experiments on animals point in a certain direction as to what to think or not to think in regard to the physiological occurrence in man. They only point, but they are not conclusive.

Q. Has it any such effect on the kidneys so far as you know? A. Yes, it has a deleterious effect on the cells of the kidneys, those cells that secrete urine, hence parenchymatoris nephritis, that is to say the tissue proper, the inner tissue in contradiction to the other tissue, the secretive tissues in the kidneys according to experiments made by Siem,

are first to suffer, they undergo fatty degeneration, then they are clumped together and fill the canals through which the urine circulates and produce all sorts of irritative symptoms.

Q. Then you are speaking now of the effect upon the parenchyma of the kidneys? A. Yes, sir.

Q. Not of the liver? A. No, sir.

Q. Supposing now that the reaction of the chemicals upon each other, namely the alum and the sodium bicarbonate used in an alum baking powder, is not complete, and suppose that there should remain a small quantity of alum, say five grains or less, in a loaf of bread, would you consider it impossible that some individuals might be injuriously affected by partaking of such bread for a continuous period of months or years? A. I certainly would.

Q. In your opinion would the untoward effect of bread taken under such conditions be manifest and unequivocal at once, or do you think the effects would be more slowly developed? A. That just depends on how a man has been—on what kind of food a person has been subsisting. If persons have been taking that kind of bread all along, of course you would not be able to trace much of an ailment, or of a disease occuring or a disturbance of the digestion, to the bread consumed, or condition of the alum, but suppose that a person has been subsisting on bread that has been made with leaven and now suddenly partakes of that bread I conceive it possible that symptoms might set in immediately in the way of indigestion although he had never seen them. This is only medical reasoning, and, if I may volunteer the statement, I forbid all my patients the use of biscuit from the fact that I know a great deal of alum is used in them, that is the first rule in prescribing a diet, do not use any biscuits, and that is for the reasons because I am convinced that great deal of the indigestion of nowadays is attributable to the alum in baking powders or to bread made with alum baking powders.

Q. What have you to say about the possible solubility of alumina hydrate or hydroxide in saliva? A. I conceive it possible that even in the mouth the medium being alkaline, that alumina hydrate would be dissolved and absorbed. There are certain chemical substances that are absorbed in the mouth and I do not see any reason, at least any physiological

reason, why they should not be absorbed if they are soluble in weak alkaline media.

Q. What do you know as to its solubility in a weak alkaline media? A. I have dissolved it myself in a weak solution of sodium hydrate, it is easily soluble, and the secretion of the mouth is alkaline, of the stomach it is acid and then becomes alkaline in the intestines again.

Q. So that there are at least two stages, namely, in the mouth and below the stomach where the hydroxide might come in contact with weak alkaline solutions? A. There is no serious objection to such reasoning. It may be dissolved in the mouth, it may be dissolved in the stomach, and it may be dissolved in the intestinal tract. Whether it is absorbed in the stomach that is a different question, but if it should be injured, if there should be erosion, then it stands to reason that it is absorbed. Experiments have been made on rabbits. There was some alumina acetate, I think it was sewed up under the skin and poisoning set in. So when it comes in contact with raw surfaces alum is a dangerous drug.

Q. What ailment do you say in your observation and experience is the most prevalent one among the inhabitants of this country? A. I would say nervous dyspepsia and constipation.

Q. Upon what grounds do you make that statement? A. I know that from my own personal experience, which may, perhaps, not be conclusive, but I have read it time and again in medical literature, and as early as 1870, Beard made the statement that nervous dyspepsia, neurasthenia, was the American disease, he called it the American disease —I believe it was 1875.

Q. What sort of medicines have you observed to be most dispensed in hospitals and most sold at drug stores? A. Purgatives, that is to say, I know it from conversations with druggists; of course I am not a druggist myself. I know that constipation probably it is very hazardous to venture the percentage, in my own practice, which is a special one, there are probably seven out of ten of my patients that are afflicted in that way.

Q. With nervous dyspepsia? A. The class of patients I treat, which is principally for nervous troubles and stomach troubles.

Q. What do you say as to the possibility that the use of alum in food, including the use of alum in baking powders, may be responsible for what you have termed the American disease, or neurasthenia? A. I would say that it might be one of the factors, one of the different factors, because there is quite a conglomerate or combination of factors that produce it, and one cannot say that that is the cause of every nervousness, as a rule there are a great many causes, but I would say that alum as used in food is one of the causes of nervousness, primarily producing catarrh of the stomach, indigestion, bad nutrition and constipation. All of these are capable of making a person nervous and producing what is generally called neurasthenia or nervous prostration.

Q. Speaking of alum, I will ask you what would you consider, or what would be generally considered, as a fatal, or, at all events, dangerous dose of alum? A. A fatal dose?

Q. Or a dangerous dose. A. Well, I never have administered it in dangerous doses myself, but from what I read it is 30 grammes.

Q. You think that would be a dangerous dose? A. Yes, sir; about an ounce, a little less than an ounce.

Q. How would that be measured with a tablespoon? A. I should think a tablespoon is about half an ounce roughly stated, I never have weighed it, but I should think that is from what I know from the weight of alum.

Q. Two tablespoonfuls would make about an ounce? A. Make an ounce, possibly it is heavier, that a tablespoonful contains more than half an ounce, I could not say positively, that is an estimate.

By the Court: What is an ordinary emetic dose? A. One drachm is a safe dose, 60 grains.

Q. How much would that be in a spoon? A. About a teaspoonful.

Q. Heaping? A. From my recollection I think it is about an even teaspoonful, of course all these things are only approximate.

Q. What are the teachings of the practice of medicine in regard to the employment of drugs that are known to produce in certain individuals untoward effects, or are suspected of doing so? A. To let them alone as much as pos-

sible, do not use them if there are others that accomplish the same effect. That is the reason why alum has been discontinued, scarcely anybody administers alum, but instead tannic acid is used, which is not so dangerous, for styptic purposes, and ergot. They have supplanted alum, principally owing to its untoward and injurious effects.

Q. Of what, of alum? A. On the digestive tract.

Q. The injurious effects of alum? A. Yes, sir.

Q. What do you say is the preponderating opinion of the medical profession as to the safety on the one hand or danger on the other, of the use of alum? A. I did not know that there were any doctors that advocated alum made bread, or bread which contained alum until I heard it here in this court room.

Q. Is it your opinion that the weight of medical opinion and authority is on the other side of that question, that it is harmful and dangerous? A. I think every doctor is against it, yes.

Q. I will ask you, although it may have been implied in what you have said, would you in any case prescribe or advise the use of a baking powder containing alum in the preparation of human food? A. I would not.

Cross-examination.

By Mr. Seddon: Doctor, your specialty is neurology is it not? A. Yes, sir; it is now and has been for quite a number of years.

Q. For about how many years, Doctor? A. About fifteen years—may be a little longer.

Q. You have devoted yourself to that specialty for something over fifteen years? A. Yes, sir.

Q. Have you devoted yourself to what is known as the physiological side of medicine, of the medical science? A. Yes, sir; I taught physiology at the Missouri Medical College for many years.

Q. You do not claim to be an expert do you? A. Not now. I have not had the time to devote to it of late years and of course could not keep myself up in it.

Q. About what time was it that you began giving up that branch of the science? A. About eight or nine years

ago. As a consequence I am hardly in touch with the matter of to-day on that branch of the science.

Q. You are not an analytical chemist either, are you? A. No, sir; I don't claim to be that.

Q. You would not claim to be a chemist in any sense of the word? A. No, sir; not in any sense of the word.

Q. You speak of the injurious effects produced by the administration of alum. In that connection you refer to the administration of what is known as pure alum—crystalized alum? A. Yes, sir.

Q. In medicinal doses? A. Yes, sir.

Q. Do you know in what form the elements obtained from alum used in the baking powder, in making the bread, exist in the bread? A. I am informed—

Q. I do not want to know what you are informed, Doctor, unless you base that information upon something you have gained from your study of medical science, information gained from learned authorities in the science. If that is the source of your information you may state it, otherwise I would not want you to state what you may merely have on information? A. It is a very elementary proposition in chemistry that if alum comes in contact with the bicarbonate of soda in the presence of sufficient moisture the sulphate of aluminum contained in the alum liberates the carbonic acid gas and there is left a hydrate of aluminum and sodium sulphate, better known as Glauber's salts. That is all I know.

Q. That is all you know about it? A. Yes, sir; an elementary proposition.

Q. You do not know what compounds it makes with the compounds contained in the flour? A. I do not.

Q. For all you know it may make insoluble compounds with the chemical constituents of the flour, the gluten and mucedin and the other elements in there? A. All that is possible and if it were stated by any reputable authority I would believe it.

Q. You do not deny it? A. Certainly not. I know nothing about it. If that statement is made by any reputable authority I would have no hesitation in accepting it.

Q. Now have you ever tried any experiments yourself or do you know of any experiments made that are recorded in the standard scientific medical works of the effect

of using bread cooked with alum baking powder upon the human stomach? A. I never have.

Q. Then what you say about it, your opinion about it, is merely drawn from your inference—from your scientific knowledge on the subject, is it not? A. Yes, sir; my reasoning as a medical man.

Q. You do not know, not being a chemist, what becomes of the hydrate of aluminum when it goes into the stomach, do you? A. How do you mean?

Q. Whether it forms, with lactic acid, lactate of alumina; or whether it forms acetate of alumina with acetic acid or whether it forms compounds with the hydrochloric acid, or what goes on? A. No, sir; I do not.

Q. Now have you or anybody else ever determined that? A. No, sir.

Q. You nor anyone else have ever determined or know from your own determination what compounds the alum goes into in the human stomach? A. There is a lamentable lack of information on that subject.

Q. There is a most lamentable lack of data from which your inferences can be drawn? A. No, I base my inferences on reason.

Q. On pure alum? A. I didn't say pure alum at all.

Q. I am speaking of the aluminum compounds. I refer to compounds that it may form with lactic acid if present, or acetic acid? A. No determinations have been made as to what actually takes place. What I have stated to you is my inference—my reasoning as a medical man.

Q. Don't you know that both Stille and Mersch state that alumina has quite a different effect from alum itself? A. Well, against that citation I would cite Hager the Commentator on the German Pharmacopaeia who speaks of the action of hydrate of aluminum being the same as crystalized alum.

Q. Who is that? A. Hager, in his Commentary in the second edition of Prussian Pharmacopaeia.

Q. I will now read from Stille and Mesch on page 169 wherein I find the following:

"Hydrate of Alumina in its appearance resembles the oxide of bismuth and also magnesia, in its action and uses. Like the former it is absorbent and protective, and like the

latter it is antacid. It is suitable for the treatment of dyspepsia and diarrhoea when they depend upon the excess of acid in the digestive canal. In Germany it is used in infantile disorders of the stomach and bowels. It may be given in doses of from 3 to 6 grains. It may be applied externally as a substitute for the oxide of zinc or the oxide of bismuth, being similarly protective in cases of intertrigo, superficial burns, etc."

What have you to say to that statement? A. I do not wish to discredit their statements.

Q. You do not discredit that statement? A. No, sir.

Q. Major Cunningham has suggested that I had better let you read the statement, just take the book (handing witness the book). Please read it for yourself.

(Whereupon, after the witness had read the passage referred to, the examination was resumed as follows:)

Q. They are authorities on the subject are they not? A. Yes, sir.

Q. What have you to say to it then? A. Well, I can only refer you to the Commentaries of Hager cited a few moments ago.

The Court: What do you say to the statement contained in that extract in relation to the excess of acid in the intestinal canal? A. Do you mean as it relates to acid in the stomach?

Q. No, not acid in the stomach. It is spoken of there as acid in the intestinal canal? A. It should be alkaline. If it is acid there is disease. Very frequently in children we have an acid reaction of the evacuations which would demonstrate that the contents of the alimentary canal is in an acid condition, therefore in a diseased condition.

Q. You say in a diseased condition? A. Yes, sir.

Q. If it was an alkaline condition it would be neutralized? A. Yes, sir.

Judge Seddon (resuming): When was your attention first called to this case—when did you first take hold of the case? A. I took hold of the case—I didn't take hold of the case.

Q. When was your attention first called to it? A. My attention was first called to it—I don't remember the date but it was some time after the case was commenced.

Q. How was your attention first called to it? A. Professor Potter came to me and asked my opinion or asked my standing in regard to alum in baking powder and when I stated that my opinion was unfavorable to the use of alum in baking powder he asked me if I would be willing to testify?

Q. Well Doctor, you have given these gentlemen here present all the assistance you could in presenting this case to the Court, have you not? A. Which gentlemen—the Major?

Q. The attorney for the State, Major Cunningham and Doctor McMurtrie who has been so kindly assisting him in these matters? A. Doctor McMurtrie don't need any assistance. I had a number of consultations about the various aspects of the case from a medical point of view.

Q. You have assisted in running around and getting up witnesses have you not? A. I never run around in all my life getting up witnesses. I called up by telephone Doctore Moore and incidentally at the Medical Society I met Doctor Keiffer, and I told Doctor Close to come to my office after Professor Potter notified me that Doctor Close would take part in the deliberations.

Q. And you have been more or less assistance to counsel in securing witnesses for this case? A. Yes, sir; I have assisted them some.

Q. I suppose you have been paid for your services? A. Have I been paid for my services? No, sir; but I expect to be paid.

Q. You say you expect to be paid? A. Yes, sir.

Q. To whom are you looking for your pay? A. That is a very difficult question to answer. I do not know who will pay me or whether I will be paid at all or not.

Q. You expect to be paid though? A. I hope to be paid, yes sir.

Q. Now I understood you to say, Doctor, that neurasthenia—I believe that is the correct pronunciation isn't it? A. Neurasthenia.

Q. Well, you say that it is a prevalent complaint among the American people? A. Yes, sir.

Q. You cite some authority, I believe, whose name I did not catch, who stated that it was observed as far back as 1870? A. I think as far back as 1870 or 76.

Q. Who was that authority? A. Baird.

Q. The disease had been so prevalent as early as 70 or 76 that attention was called to it at that time? A. Baird had never heard of those symptoms and when he investigated the matter he referred to it as the American disease.

Q. And he spoke of it as early as 70 or 76 you say? A. Yes, sir.

Q. Doctor when did you first come to the conclusion that the possible use of bread cooked with alum baking powder was the cause or one of the causes of this prevalent disease? A. Very naturally if a man is engaged in the treatment of diseases of the stomach, as I am, and especially in the treatment of nervous diseases he will cast about to find the cause. In those cases of course we pay a great deal of attention to the food. We go very carefully into that question because it is a very important factor in the question and for the reason that alum is used in baking powder I generally, in fact always advise against the use of baking powder made with alum and I advise against the use of biscuit knowing that they are generally made in that way, and I recommend in its place the use of stale bread made either from wheat or rye flour and leavened with the old testamentary leaven.

Q. You advise, then, that your patients should not use bread baked with baking powder, but that they should bake it with yeast, is that it? A. I did not state that.

Q. What was your statement? A. My statement was that I always advised against the use of biscuit knowing that they are generally made with baking powder.

Q. Did you inquire of your patients whether they use biscuit made with baking powder? A. No, I didn't feel called on to ascertain how they make the biscuit, but knowing that they are as a rule made with baking powder I advised against it and recommended stale bread made as stated a moment ago.

Q. Did you inquire of any of your patients if they used alum baking powder in the prepartion of their food? A. I never inquired if they made their biscuit with alum baking powder, but I think that a great deal of it is used and many of them do so.

Q. You didn't make it a point to inquire whether they had been using alum baking powder right along did you? A. No, sir.

Q. You did not? A. No, sir; I took it for granted that many of them were, because a large amount of it is used.

Q. Now Doctor, when did you come to the conclusion that there was possibly some connection between the prevalence of this disease and the use of baking powder in preparing food, that is to say, when did you first come to the conclusion that there was a possibility that this disease was due to the use of bread cooked with alum baking powder? A. You misstate my proposition very much.

Q. I do not wish to do so Doctor. I merely want to state it fairly. You have stated that this neuresthenia was a most prevalent disease here in America and as I understood you there was, in your opinion, a possibility that it was caused in part by the use of bread that had been cooked with alum baking powder? A. Yes, sir.

Q. Now then when, that is, how long ago did you come to the conclusion about the possibility of the baking powder having somthing to do with it? A. I came to that conclusion about ten years ago.

Q. Do you remember, Doctor, of a conversation you had with me on the train when I traveled from St. Louis to Union, Mo., with you, when we were going to attend the trial of the unfortunate Deustrow, when you were going up there to testify as an expert, that you had a conversation with me on the train which proved certainly very delightful to me I must say and very instructive, in which you discussed at some length this question of neuresthenia—did you during that conversation mention the fact at all that alum used in the form of an alum baking powder had anything to do with the prevalence of that disease. Did you suggest that to me in that conversation? A. I suppose, like a Yankee I am permitted to ask a question. Did I talk about the case?

Q. You talked to me about neuresthenia—you lectured—I do not know how to express it any better than that, and I want to say that it was a very instructive talk in which I was much interested and you especially dwelt upon the rapidity with which people are becoming neurotic, and went con-

siderably into the details of the disease and the various causes of it? A. I do not recall the conversation, but if you say that I spoke of the disease I certainly take your word for it.

Q. Did you say that you thought it was in part due to the use of alum baking powder in the preparation of food—did you state that as a possible factor in producing the disease? A. I haven't the slightest recollection of that conversation.

Q. You do not deny it? A. Oh, no; I do not deny it. I take your word for it. You have mentioned it.

Q. My point was that you went into the question of the causes of the disease and that you did not mention alum used in the form of baking powder as one of those causes, but if you have no recollection of the conversation of course I cannot pursue that line of inquiry further.

Q. Doctor, does the saliva of the mouth contain water? A. Certainly.

Q. I think you have contributed very largely to medical literature have you not? A. Somewhat.

Q. You have published a great many papers, many of which I have read in which you have discussed various subjects connected with the medical science? A. Yes, sir.

Q. Have you ever published anything in the medical line that is in the way of medical literature on the subject of neurasthenia or the neurotic condition of the American people in which you attributed it in any way to the use of bread or other food cooked with alum baking powder? A. No, sir; I have not.

Q. In any treatises that you have written discussing the causes of the disease you have never mentioned alum used in the form of an alum baking powder as contributing thereto? A. No, sir.

Q. Now you say that all Doctors are against it. Isn't that a very broad statement to make, Doctor? A. I said that it was my opinion until I came here that all doctors were against it, but here I heard testimony from some physicians for whom I have the greatest respect, to the contrary.

The Court: I presume, Doctor, that you are familiar with the general medical literature on the subject of diseases caused by the use of impure food, are you not? A. Well, I always try to keep myself posted on the medical literature on that subject.

Q. And in that connection, you being a specialist I suppose you interest yourself on the question of the adulteration of food? A. Yes, sir; that is an important part of the business. Much attention has been paid to that lately, especially in foreign countries—not so much here in this country.

Q. And you have heard of course of the adulteration of food by the use of various substances? A. Yes, sir; by the use of salycic acid proper and other things objectionable.

Q. Now can you recall in all the literature you have read upon the subject where anyone has ascribed the existence of any disease to the use of alum as an ingredient in the baking powder? A. You mean any special case?

Q. Yes. A. No, sir; no special case.

Q. How generally in your opinion is the use of alum as an ingredient in baking powder used in the preparation of food? A. I have no knowledge on the subject. Not even an idea.

Q. Are you not aware that generally speaking a majority of the inhabitants of this country use food prepared from baking powder containing alum? A. Well, I believe they do, although I have no statistics on the subject. I know that generally speaking it is used to a very large extent.

Q. Would not the fact that such general use of alum in baking powder used in the preparation of food extending over a period of many years without any specific results attributed to its use have some bearing upon the question of your opinion in this matter? A. Yes, sir; in that that we know that certain drugs have an injurious influence on the health and it is often the fact that the cause of certain diseases will remain hidden generation after generation and then suddenly somebody will make the discovery as to the cause and we can trace it then down to the very beginning.

Q. Is it not very strange if its use is so injurious that no direct connection has ever been traced between any particular disease and the use of alum baking powder in the preparation of human food? A. Well, as I stated before some things that way remain hidden generation after generation and the fact that nothing is known now does not demonstrate to my mind that it may not be a factor.

Q. Are not the medical profession very conservative in regard to those matters? A. Well, sometimes they are

willing to accept a thing you might say without rhyme or reason because it happens to strike the fancy of a large body of doctors and very often, it has been observed in the practice of medicine that a certain remedy will be seized by the medical profession and generally adopted and very soon it is entirely thrown aside and forgotten.

Q. Are you aware whether or not that large amounts of bread stuffs are supplied by the national Government and the various city governments and military posts and institutions throughout this country in which alum is used as an ingredient in the baking powder used in the preparation thereof? A. No, I am not aware of that fact. If it is a fact I think it should be abandoned at once.

Q. Is it not a fact that many of the institutions of this city use alum in the preparation of bread supplied to patients and prisoners? A. If it is it should be abolished. I did not know it was so used.

Judge Seddon (resuming): Doctor you spoke of hydrate of alumina as being soluble in the acids of the saliva, possibly? A. The alkaline.

Q. You are not a chemist? A. No, sir.

Q. And you made no test? A. No, I didn't make any test, but that belongs to such elementary chemistry that it does not require much chemical knowledge to ascertain that fact.

Q. What alkali would it be soluble in? A. It would only be soluble in the gelatinous form. The powdered form is highly insoluble because I tried that myself on the tongue.

Q. Do you know in what alkaline it is soluble? A. Yes, sir; certainly, in sodium hydrate and potassium hydrate.

Q. Is it soluble in sodium carbonate? A. How is that?

Q. Is it soluble in sodium carbonate? A. I do not know.

Redirect Examination.

By Major Cunningham: You were asked by his Honor whether you were aware of the fact that alum was used in some of the city departments and you answered that you

were not aware of the fact. I now ask you if you are not aware of the fact that in the service of the United States and all its departments where food is procured by authority, in all camps and hospitals and public institutions, the use of alum baking powder is inhibited. My question is, are you aware of that fact? A. No, sir; I am not aware of that fact.

WILLIAM M. CHAUVENET, being called and sworn testified on the part of the State in rebuttal as follows:

Direct Examination.

By Mr. Cunningham: State your full name? A. William M. Chauvenet.

Q. You are a resident of the city of St. Louis? A. Yes, sir.

Q. What is your occupation? A. I am a chemist and mining engineer.

Q. Of what schools, colleges or institutions of learning are you a graduate? A. I am a graduate of the Washington University here in St. Louis where I took a special course in mining engineering, including a special course in chemistry. I then went with the United States Geological Survey in the Chemical Laboratory at Newport, where I remained three years with Doctor Gooch who is now at the head of the Kent Medical Laboratory at Yale, and Mr. A. A. Blair, then the head of the Geological Survey Laboratory. I then returned to St. Louis in 1882 and entered the laboratory of Chauvenet and Blair where I spent two years, ultimately becoming a partner of my brother Regis Chauvenet and for the last sixteen years I have been a practicing chemist analyzing various materials and products that have been brought to me.

Q. Mr. Chauvenet, have you done any work upon the subject of food and its adulterations? A. Yes, sir.

Q. Please state in a general way your experience in that regard? A. In a chemical laboratory where all commercial products, food products among others are brought to be submitted to analysis, I have come in contact with a great many food products and I have analyzed flour, tea,

coffee, pickles, wine and many other food products including bread, cake, baking powder and other articles of food.

Q. Well, has your attention been directed at all to the question of the use of alum in the preparation of food? A. It has.

Q. What, if any researches, tests or experiments have you made to determine that question? A. You mean the use of alum in the preparation of food?

Q. Yes. A. I have on many occasions in the years that I have been engaged in the business sampled baking powder submitted to me and I have given this question of alum in the use of baking powder, or rather alum used as an ingredient of baking powder a great deal of thought and attention and later since this case was brought up I made special investigations covering certain phases of the case.

Q. Leaving those special determinations for the present I will ask you what conclusion you have reached in regard to the use of alum in the preparation of food, as to whether or not it is wholesome and harmless?

Objected to as being purely a physiological question and this witness has not qualified himself except as an analytical chemist.

The Court: In the present state of the examination I will sustain the objection.

Q. Have you read the depositions of Doctors Smith and Flint taken in this case? A. Yes, sir.

Q. What criticisms, if any, have you to make upon the methods and experiments of Doctor Smith and the conclusions he reaches from those experiments?

Objected to on the ground that this witness has qualified as an analytical chemist and he is called upon to criticize the experiments of Doctor Smith from the standpoint of a physiologist.

The Witness: I can answer that question chemically if you want it.

The Court: He may limit his answers to the chemical phases of the case at present—to the chemical analyses and methods.

Q. Very well Mr. Chauvenet, the Court says you must limit your answers to the chemical phases of the question. A. My chief criticisms of Doctor Smith's deposition are from a chemical standpoint. I do not undertake to decide physiological questions, nor do I qualify as a physiological chemist. The experiments of Doctor Smith, as related on page 13—

Judge Seddon: Are you referring now to the printed record? A. Yes, page 13 of the printed record. He says there that the experiments were undertaken to ascertain whether food prepared with the Layton baking powder would interfere with the process of the secretions in the stomach. Since the quantity was not measured and since the chemical analysis would not detect them in the faeces it seems to me that the conclusions of Doctor Smith are not correct, and are not the conclusions that could be drawn from what I find stated there.

Judge Seddon: Doctor Smith drew certain physiological conclusions.

The Court: I understood Doctor Smith in relation to those experiments that it was purely a chemical experiment.

The Witness: I am merely criticizing Doctor Smith in that he did not measure how much gastric juice was secreted and I think that his conclusions from the cases of Doctors Ross and Irish are not such conclusions as could be drawn from the experiment as reported there being fatally defective from a chemical standpoint and affording no foundation for his subsequent physiological discussion.

Q. Is there anything else touching the testimony of Doctor Smith? A. Not on that point.

Q. What do you say about the statements of Doctor Smith that alum or its constituents, is found in almost all drinking water? A. I have examined hundreds of samples of drinking water and have read treatises by the most distinguished chemists of the world on that question and I think it is a very misleading statement on his part when he says that alum is a constituent of all drinking water. I would

say decidedly it is a rare constituent of drinking water. Sometimes we come across a mere trace.

Q. Have you seen many specimens of baking powder offered for sale in the market? A. Yes, sir.

Q. Have you ever seen any of them marked as indicating that they contain alum?

Judge Seddon: I make the same objection to that question that I have to similar questions when propounded before.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

Q. If the alum in the baking powder is in excess will it remain in the bread as free alum after reaction takes place? A. The excess of alum will be found in the residue.

Q. Will such residue in the bread be soluble in the stomach if the bread is taken into the stomach as food? A. Yes, sir.

Q. Will you tell us now the details of the determinations and experiments that you made with reference to this case on trial? A. Yes, sir.

Q. Go on and state what you have to say on that subject? A. My experiments were directed to the point of the solubility of the aluminum hydrate in the gastric juice. I began with a half an ounce of Layton baking powder being the amount which I put in a quart and a half of flour so that the bread when brought to me after it had been baked by my cook, the preparation thereof having been personally attended to by me, weighed 959.76 grammes. I took 80 grammes of this bread and passed it through a 20 mesh sieve to get it in a finely divided condition and digested the 80 grammes in one liter of gastric juice made according to the formula of Fremey, Richet and Schmitz, which formula was as follows:

Water 999.4 part per 1,000; pepsin 3.19 parts per 1,000; sodium chloride 1.46 parts per 1,000; calcium chloride .06 parts per 1,000; calcium .55 parts per 1,000; free hydro-

chloric acid .07 parts per 1,000; phosphate of iron .12 parts per 1,000.

Q. Did you report calcium chloride? A. I may have omitted that and that there may be no mistake about it I had better repeat it again. I may have omitted something.

Judge Seddon: Please read it slowly so that I may get it down? A. The formula is as follows:

Water 994.4 parts per 1,000; pepsin 3.19 parts per 1,000; sodium chloride 1.46 parts per 1,000; calcium chloride .06 parts per 1,000; potassium chloride .55 parts per 1,000; phosphate of iron .12 parts per 1,000; hydrochloric acid .07 parts per 1,000.

I want to state my reasons for .7 parts per 1,000 of hydrochloric acid. That is the amount that in the opinion of the best authorities is the quantity that is present in all stages of digestion of the gastric juice.

Q. What did you say about this formula as to the authority for it? A. It was a reproduction of the gastric juice of the stomach according to the formula of Schmitz, that is, his conclusions as to the probable composition of the gastric juice in the human stomach after he had himself discussed the results with Richet and Fremy in his Encyclopedia Chemique, 1889, Volume 9.

Q. What do you say as to that being the best formula? A. That is the best formula that I could find.

Judge Seddon: I object to that on the ground that this witness not being a physiologist or a physiological chemist is not authorized to speak in regard to those matters.

The Court: I will consider this testimony in the light of Mr. Chauvenet's qualifications on the subject. The Court is not bound to accept the interpretation that a witness or counsel may put upon a given question.

Judge Seddon: Do you think it is fair for him to state that this is approximately the composition of the gastric juice in the human stomach when he himself does not claim to be a physiological chemist?

The Court: I will take his statements for what they are worth. If you wish to cross-examine him on the question of the composition of the gastric juice of the stomach you, of course, may do so when you come to the cross-examination.

Mr. Cunningham: Please answer the question? A. I therefore had a combination which we call artificial gastric juice and I wish to state in that connection that a chemist is not obliged to confine himself to inorganic matters. I was endeavoring to find just what that artificial gastric juice would dissolve. I took 80 grammes of the bread that was digested for two hours and a half at a temperature of from 99 to 100 degrees Fahrenheit, filtered it on a large ribbed filter. Washed it once or twice and I will state that in the meantime the temperature was kept around 99 degrees and at no time during the process did the solution attain a greater temperature that between 99 and 100 degrees Fahrenheit. The filtrate from the mass of bread was then run to dryness in a large platinum dish and sulphuric acid was added at this stage of the operation to aid in the destruction of any organic matter that might be present and was finally allowed to run to complete dryness and slowly ignited to further destroy any organic matter that might yet remain. This residue was dissolved in hot water with a little hydrochloric acid and again run to dryness in a platinum dish and again taken up after ignition with hydrochloric acid and hot water and diluted to about 150 cubic centimeters. The whole of the phosphate was precipitated by a Molybdic solution of ammonia, after which it was carefully digested at a temperature of 122 degrees Fahrenheit for an hour and a half and again filtered through a small filter and allowed to stand for an hour and a half. If you please, I have omitted to state one process that I should have given. I should have stated that before the addition of the Molybdic solution of ammonia the whole of the phosphate of aluminum which might have been present were thrown out by the addition of ammonia and these precipitates, or rather this precipitate, which was bulky was put into a solution of hydrochloric acid diluted and then the Molybdean solution was added to separate any phosphoric acid from any possible oxides of iron or alumina that might be

present. The filtrate was then cooled until it was about 60 degrees Fahrenheit in temperature. The ammonia gave a precipitate of both alumina and aluminum hydrate and a sesqueoxide of iron. The presence of the iron being indicated by a slight reddish color of the two precipitates. The aluminum and the iron oxides were then filtered off together. The two precipitates were then fused with carbonate of soda and the iron was separated from the aluminum and the alumina by the addition of tartaric acid and sulphide of ammonia which threw out the iron and its sulphides and allowed the alumina to remain in the solution. The sulphide of iron was filtered off and the solution was again run to dryness in a platinum dish and fused and ignited and any organic matter that might remain was thus destroyed. Hydrochloric acid is now added and it is again reduced to dryness in the dish and hot water and ammonia in slight excess again added, care being taken that all of the alumina should be precipitated. I then have the precipitate which appeared to be aluminum hydrate and which on filtering off was ignited and I found it to weigh two-tenths of one grain which will be seen, if the calculation be made, that the total possible Al2 O3, aluminum hydrate in the portion of bread, namely 80 grammes, was .772 grains of which two-tenths of a grain would be 25.9 per cent. indicating the amount of soluble alumina compound or salts contained in that amount of bread. I did not rest content with one experiment.

Q. Pardon me a moment, but you stated that the chemical symbol for aluminum hydrate was Al2O3; was that aluminum hydrate? A. That was a blunder. It should be Al-2 (OH) 6.

Q. What would be the Al2O3? A. That would be sesquioxide of alumina. I wished to prove the solubility of the aluminum hydrate not in connection with the bread and for that purpose I took 3.05 of aluminum hydrate and digested it at the temperature of 99 to 100 degrees Fahrenheit for two and a half hours and then determined the per cent. of soluble alumina exactly as in the previous experiment, from which I got 24.5 showing that the amount digested in the bread was slightly in excess, that is to say, the amount of soluble alumina in the bread was greater than the amount taken from a sample of the baking powder that had not been used in making bread.

Q. Thereby indicating that it was just as soluble in the bread or in fact a little more so than it was the other way? A. Yes, sir.

Q. Now that .772, was that hydrate or oxide? A. That was oxide.

Q. How about the .2 that you speak of? A. That is also oxide.

Judge Seddon: What is that oxide? A. That has been spoken of heretofore as Al2O3.

Q. And it is the substance which finally weighed determined the alumina? A. Yes, sir.

Q. From that you calculated the hydrate? A. From that I may have calculated the hydrate. I want to say of course I destroyed the organic matter in this second experiment exactly as in the first experiment.

Q. Now is there any other experiment that you wish to detail in connection with this matter besides those you have already gone into? A. I have tried the Layton bread with water for the purpose of seeing how far the aluminum salts were soluble in water, but the amount precipitated was too trifling to be reported. It was nothing more than a trace, although present.

Q. From your experiments would you or would you not conclude that the natural gastric juice of the stomach has greater solvent action on the alumina hydrate than has the artificial gastric juice prepared by you?

Objected to on the ground that it calls for a conclusion in physiological chemistry.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

Q. What is your conclusion from these experiments, as to the statements made by certain witnesses in this case that the aluminum hydrate as it exists in the bread after baking, the bread being made with alum baking powder,

is insoluble? A. I mean to say that whoever testified to that effect is wholly wrong in his statement.

Q. What is the bulk of 10.17 grains of aluminum hydrate, as it exists in the bread after baking? A. I have a sample here of 10.17 grains which I have carefully weighed and which was exposed for two and a half hours at a temperature of 212 degrees, which is longer than bread is baked and the amount appears at the bottom of the flask. It will take almost any bulk according to the amount of water left in it. I reduced it here down to just what it would be as it actually existed in the bread which is exposed to 212 degrees in the oven.

Mr. Cunningham: We will now offer in evidence the sample of aluminum hydrate identified by the witness and ask that it be marked plaintiff's exhibit 11.

Q. Mr. Chauvenet, does the residuum left in the bread made with alum baking powder serve any useful purpose in the animal economy when such bread is consumed as human food?

Objected to as incompetent.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

Q. Do you consider alum baking powder a healthful and wholesome substance when used in the preparation of food.

Same objection.

Objection sustained.

Plaintiff's counsel then and there excepted to the ruling of the Court at the time.

At this stage of the examination an adjournment was taken to February 15th, at 10 a. m.

On February 15, 1900, the Court met and the hearing of the case was resumed.

WILLIAM M. CHAUVENET, further testifies as follows:

Cross-examination.

By Mr. Seddon: Mr. Chauvenet, I believe you said you qualified merely as an analytical chemist and not as a physiologist? A. I did, sir.

Q. Now, I suppose that you have never taken any course of medical study? A. No, sir.

Q. You have never devoted yourself to the study of medicine, have you? A. I have not.

Q. You have never made any experiments, physiological experiments have you, I suppose? A. I have not.

Q. Then you do not claim to have any further knowledge of physiology than any other competent and intelligent analytical chemist, do you? A. No, sir.

Q. I do not suppose that you would consider yourself competent to express an opinion on a matter of physiology? A. I would not.

Q. Would you consider your opinion on any physiological question entitled to any weight as a physiologist? A. Only where it touched chemical questions.

Q. Now, Mr. Chauvenet, when were you first connected with this case in any way? A. I think it was the end of October, 1899.

Q. State how you became interested in any way in the case? A. Major Cunningham came to my office and asked me if I would testify in this case.

Q. What did you undertake to do after conversing with Major Cunningham on the subject? A. Major Cunningham told me that there would be more or less analytical work which it would be probably necessary to do, and I agreed to undertake such work as he might submit to me. That was the whole of our arrangement.

Q. And I suppose you made arrangements for your compensation? A. I did at that time make arrangements with no definite knowledge as to what was coming and there-

fore with no definite figures stated as to my compensation.

Q. I do not want to ask you what your figures are. You look then, to whom for your compensation? A. Major Cunningham.

Q. You do not look to the State of Missouri for your compensation in any way? A. No, sir.

Q. You have been present a good deal in Court during the progress of this case, have you not? A. I have.

Q. I believe you have generally sat between Major Cunningham and Dr. McMurtry? A. At times.

Q. I will ask you if you have not generally, when you were in Court, sat there? A. I believe so.

Q. And as the evidence was being given you have made suggestions to Major Cunningham in writing or verbally of questions to be asked, have you not? A. More or less.

Q. Have you assisted in the prosecution in any other way than making those experiments and in the manner indicated in your replies to my questions? A. I have.

Q. Kindly state in what manner you have assisted the prosecution? A. Well, I looked up the literary references and located the works of reference and made lists setting forth where such works would be found in St. Louis in the libraries; I read those books and prepared myself to state whether or not they were or were not in libraries in St. Louis.

Q. In any other way? A. I think not.

Q. Did you interview or speak to any witnesses on behalf of the prosecution? A. I did not.

Q. You had no part in that? A. I consulted with Prof. Potter concerning certain chemical experiments, but I was not responsible for Prof. Potter's retention in the case.

Q. Have you made any experiments other than those that you have mentioned in your chief examination in pursuance of your retainer, if I may speak of it as such, by Major Cunningham? A. I have made other experiments which were collateral experiments.

Q. You did not think that they bore upon the question involved? A. They helped me in my decision, in my final conclusions.

Q. Now, I will ask you some questions quite briefly with reference to the experiments that you have detailed. I

understood you to say that you took Layton baking powder? A. I did, sir.

Q. Where did you get the powder? A. I got it from Prof. Potter who had a box of the blue label, Layton's Blue Label Baking Powder.

Q. You got it from Prof. Potter; was it sealed when you got it? A. The box?

Q. Yes. A. No, the lid was not sealed upon the box when I got it, it had been opened by Prof. Potter and a portion used for his experiments, but I identified the box and made a note of its label and gave to Prof. Potter the package from which I had taken the powder.

Mr. Cunningham: Prof. Chauvenet's experiments and tests were made some days later than Prof. Potter's and the can probably had stood more or less open from the time that Prof. Potter unsealed it to the time that Prof. Chauvenet made his experiments. The two were not made simultaneously. After Prof. Potter had taken out as much as he wanted for his experiments, Prof. Chauvenet took from the box what he wanted to use and returned the box to Prof. Potter.

Mr. Seddon: I accept the assurance of counsel that it is the same baking powder, I only wanted to be sure of it.

Q. Did you analyze it? A. Partially.

Q. You did not make a complete analysis? A. I did not.

Q. How much did you report of hydroxide of alumina was in the loaf in your testimony? A. In the loaf of bread baked by me?

Q. Yes. A. There were 9.27 grains of oxide of aluminum, Al_2O_3, I think I said nothing about the amount of alum.

Q. I did not say alum hydroxide? A. That was not hydroxide, 9.27 grains, not of hydroxide, but of Al_2O_3 which is alumina.

Q. Did you ascertain how much oxide of alumina was in the loaf? A. I did not, I did not make the calculation, but it is simple.

Q. Did you ascertain how much oxide of alumina was there? A. I didn't ascertain, I analyzed the baking powder and discovered it had 20 per cent. of alum, I therefore assumed that it was a constant and that when I used half an ounce of the powder that half ounce must theoretically contain 9.27 grains of alumina.

Q. How much was the alumina that you actually weighed .2 of a grain.

Q. What was it, the oxide of aluminum? A. It was weighed as oxide of aluminum which had been carefully proven to be oxide of aluminum.

Q. Did you ascertain how much hydroxide, if any, was in the bread? A. I did not, I assumed it was there as hydroxide and proceeded on that basis. The amount is a calculated amount founded upon many analyses of the powder before I used it.

Q. Now, have you got the exact figures of the amount of alum that was in the powder which you used for cooking the bread? A. I have not got those figures with me, I know it was 20 per cent., and I think .1.

Q. Taking 100 parts it was 20.1? A. Yes, sir.

Q. What form of alum was it? A. It was what we know as soda alum.

Q. Will you give the formula for it? A. Na2SOAl2 (SO4)4; I may say I did not determine whether that was soda alum or some other kind of alum that was in the baking powder, therefore, I cannot answer whether it was soda alum or ammonia alum, I carried the investigation no further than to determine the amount of alumina present.

Q. You took this bread and dried it and crumbled it up fine and passed it through a sieve? A. Yes, sir.

Q. What was the weight of that bread? A. That bread weighed as I took it 959.76 grammes.

Q. Then you weighed off 80 grammes of the crumbs? A. I did.

Q. How many grains is that, can you calculate it and give it to us? A. Yes, although I didn't calculate it; 15.43 grains in a gramme.

Q. 15.432, is it not? A. Yes, I will take it at .43, 123.44 grains, 1234.4 grains.

Q. 5 grains? A. Yes, sir.

Q. Then you made a liter of this artificial, what you

call artificial gastric juice? A. I did.

Q. Did you weigh that? A. I did not, I measured that, I weighed a part of it.

Q. Do you know how much a liter of it weighed? A. I do.

Q. How much? A. It weighed 1,000 grammes. I may state here that it weighed 1,000 and a fraction over, .4, because when I distributed the amount the hydrochloric acid given in the original formula of Dr. Smith and changed it from .22 of a part per thousand, to .7 of a part per thousand, and introduced that into a full liter of water, I did not pay any attention to the slight difference of the dilution, it would be too insignificant to note.

Q. Did you make any tests of the different component parts of the gastric juice to ascertain whether they were free of any alumina compounds? A. I used pure distilled water which I had tested for the absence of alum; I used chemicals bought at the best chemical house supposed to be C. P. chemicals, therefore should have contained no traces of alumina whatever, but I did not analyze for alumina because none of them are ever found in common practice to contain alum or alumina.

Q. You bought them from what you considered a reliable house and weighed them in these various parts and mixed them up and produced what you consider an artificial gastric juice? A. Yes, sir.

Q. And you weighed off a liter? A. Yes, sir.

Q. Then you deposited 80 grammes of bread in the liter of artificial gastric juice? A. I did.

Q. Then you filtered that digested solution, did you not? A. Yes.

Q. How did you filter it? A. I filtered it through Swedish filter paper suspended in a glass funnel.

Q. Then you applied sulphuric acid to the residue after the filtration, the filtrate we will call it, to burn off the organic matter you said, did you not? A. No, sir.

Q. What did you do? A. I added sulphuric acid, some 20 cubic centimeters and then run the solution to dryness.

Q. I intended to say that; how do you mean run it to dryness? A. Boiled it slowly until it became a crusty mass to which additional sulphuric acid was added, then the whole

was slowly evaporated to dryness, to complete dryness, and ignited in a platinum dish over a Bunsen flame until much of the carbonaceous matter had been destroyed and the mass remained white.

Q. When you added the sulphuric acid, in what kind of vessel was the mixture contained? A. The sulphuric acid was not added until the solution had been largely reduced in volume and introduced in a platinum dish, then the sulphuric acid was added and a continuance of the drying process carried on.

Q. What was the object of the sulphuric acid? A. Sulphuric acid destroys organic matter or carbon when heated and strong. My purpose was to destroy organic matter.

Q. After you had treated it with sulphuric acid and had dried it, had burned it, had ignited it? A. Yes.

Q. You considered you had gotten rid of all the organic matter, did you not? A. No, I carried the destruction still further. I took it up with hydrochloric acid and hot water.

Q. Took that residue? A. Yes, sir.

Q. To what heat did you ignite this, did you ascertain? A. Red heat, I suppose 1200 or 1500 degrees.

Q. Go on? A. I took it up with hydrochloric acid and hot water and boiled it thoroughly, filtered again for insoluble matter and ran the filtrate a second time.

Q. What was the process of the filtration? A. I filtered it through the same sort of paper.

Q. And then dried it again, ran it to dryness again? A. Yes, sir; ignited it the second time.

Q. That was for the purpose of getting rid of all the organic matter? A. Yes, sir.

Q. Did you deem that you had gotten rid of all the organic matter at that time? A. I did.

Q. Then what did you do? A. Then I added hydrochloric acid and hot water, brought the whole into solution the second time and diluted it to about 150 or 200 cubic centimeters.

Q. You did what, diluted it? A. Yes, sir.

Q. Your testimony here as taken down says 150 cubic centimeters, that is wrong? A. I didn't measure it, I therefore assume it to be 150 to 200.

Q. The solution of hot water and hydrochloric acid? A. Yes, sir.

Q. Then what did you consider you had in? A. I had all the phosphates and soluble salts from the gastric juice as well as the soluble salts from the bread. I concluded the alum was all in solution, that there were traces of phosphate and iron there; there were sodium chloride, potassium chloride and calcium chloride, those things which I told you I added to making the gastric juice.

Q. You had phosphoric acid there, didn't you? A. Very small traces of it.

Q. What was your next step? A. My next step was to add ammonia slowly until I had a faint smell of ammonia in the boiling solution and threw out a heavy precipitate.

Q. Go on. A. That precipitate was gelatinous, but somewhat deceptive looking; I saw at once it had other things in it than aluminum hydrate and so I filtered again on Swedish paper, thoroughly washed the precipitate in water, washed it through the filter, dissolved it in hydrochloric acid, about 10 cubic centimeters, and diluted it to 100 cubic centimeters with water; I now added about 100 cubic centimeters of molybdate solution.

Q. That is known in chemistry as the molybdic ammonia solution? A. Yes, sir.

Q. What was your purpose of adding that molybdate of ammonia? A. I wanted to throw the double phosphate of ammonia and phosphoric acid, to get rid of the phosphoric acid, which is precipitated with ammonia in an ammoniacal solution along with the alumina.

Q. In what form does that appear? A. It forms the heavy yellow molybdate, phosphate of molybdenum of ammonia.

Q. Called the phospho molybdate of ammonia, that is the name of it? A. Yes, sir. This was very carefully digested for several hours at a temperature not higher than 120 Fahrenheit and filtered. In the filtrate I precipitated alumina with ammonia, filtered, washed and weighed.

Q. Well, did you take any steps to get out any oxide of iron that was there? A. I did, after weighing this precipitate with ammonia, finally I found it to be slightly red in color and fused it with carbonate of soda. Do you wish me to carry the experiment to the end now?

Q. Go on and I will ask questions to elucidate my difficulties as you go on. A. It is rather long, I got rid of the iron by the sulphate method and re-precipitated the alumina, and again weighed it.

Q. It is quite a complicated analysis, is it not, to separate it? A. A very tedious analysis.

Q. Requires quite a number of different steps to get rid of it, does it not? A. It does.

Q. Then you got rid of the oxide of iron and you considered that you had left alumina? A. I did.

Q. Did you test for alumina in any way? A. I did.

Q. How? A. When originally precipitated and while still in the form of alumina hydrate I tested it on the filter with an ammoniacal solution of logwood and getting the characteristic color I knew that it could be nothing but alumina because first it was alumina by exclusion and could be nothing else, and second it answered the delicate test for alumina.

Q. Is that the test you made after you had gotten this .2 of a grain? A. I made it both then and when it was still with the iron.

Q. Did you make any tests for the presence of phosphoric acid? A. I did.

Q. What tests did you make? A. The presence and precipitation of the yellow molybdate is proof of the presence of phosphoric acid.

Q. In what you weighed as .2 of a grain, I am speaking of that? A. Pardon me, I did not. The phosphoric acid added to the original solution of gastric juice was so insignificant that it could under no circumstances have formed such a bulky and gelatinous precipitate as I got and therefore there was no possible danger of any phosphoric acid escaping my precipitate with molybdate.

Q. Now, then, you undertook to precipitate phosphoric acid as you say, from the solution in which there were present salts of alumina by the molybdic solution of ammonia? A. I did.

Q. Are you not aware that you cannot do that in the presence of free hydrochloric acid in solution? A. I am not. That is one of the very common ways of separating alumina from phosphoric acid.

Q. Don't you know it is condemned by leading analytical chemists? A. I do not.

Q. Is Fresenius an authority on chemistry as some of the people have testified he is? A. He is in many respects a very excellent authority.

Q. Are you familiar with his book, Manual of Analytical Chemistry, a System of Instructions for Chemical Analysis, the new system? A. No, sir; my familiarity is entirely with the old book and the old system.

Q. I refer to the edition of 1891, published by John White & Son, New York? A. No, I have not read it.

Mr. Cunningham: I do not know what counsel is expecting to prove here or what the purpose of reading the book to the witness is; I object merely for that reason, I do not see what it has to do with the cross-examination of the witness.

The Court: The objection will be overruled. Counsel may read the matter and then submit it to the witness for examination before he answers.

By Mr. Seddon: Now, speaking of the determination of phosphoric acid in solution in which there is present the salts of aluminum, he says, "No considerable quantity of free hydrochloric acid may be present," I refer to page 375 (handing book to witness). A. I understand. He says no considerable quantity of hydrochloric acid may be present. I was very particular to see that no considerable quantity of free hydrochloric acid should be present. In the experiment with the platinum dish the quantity of hydrochloric acid that I had was inconceivably small. We are very careful not to have any considerable quantity of hydrochloric acid present in the separation of phosphoric acid in iron ore. Blair, one of the best authorities of to-day on the subject of iron analysis, always precipitates in the presence of hydrochloric acid, then in the presence of aluminum, taking care that he has no considerable quantity of the acid.

Q. There are other salts there in the form of chlorides, are there not A. Chlorides are present, yes, sir.

Q. They would tend to prevent the precipitation of phosphoric acid? A. If there was any considerable quan-

tity, but I want to say this that I find from experience that we are not obliged always to follow the exact rules or theory laid down in the books in making particular analyses where we do not have to take into account with such accuracy such minute quantities. It would hold back very little phosphoric acid or alumina.

Q. Well you say that the chlorides did act in some way to prevent precipitation? A. Yes, they did.

Q. Phosphor molybdenum of ammonia is soluble in cold water—in ammonia chloride is it not? A. Yes, to an appreciable extent.

Q. You get two-tenths of a grain, or rather you got two-tenths of a grain of what you call alumina? A. I did.

Q. Did you try the experiment more than once? A. I did not.

Q. Did you use any glass vessels at any time in the course of your experiments? A. The only time when a glass vessel was used was in the original digestion at 100 degrees Fahrenheit and I also used a glass for receiving the filtrate after digestion, but in no part of the process after the solution was run to dryness was it in a glass when the temperature was raised.

Q. Did you let any solution that had hydrochloric acid in it remain in a glass or porcelain vessel? A. No, sir; except the solution that had seven-tenths of one part, in a thousand parts of hydrochloric acid—pardon me—when I finally precipitated the alumina it was in a glass vessel, but there was an inconsiderable quantity of hydrochloric acid present—in the cold.

Q. For how long a period of time were these experiments continued? A. It took me something like four to six days to carry them through.

Q. Alumina hydroxide becomes very insoluble does it not when ignited? A. It is appreciably soluble but not soluble without great difficulty.

Q. How did you test your ammonia to see whether it was entirely free from alumina or alumina compounds? A. Didn't. It would not be possible for any to have been present under the circumstances. That ammonia that I used is what I have had year after year and I have used it on various experiments and a chemist in business that way soon learns those things and I will say that I never knew that solution at

any time to contain the slightest trace of alumina or alumina compounds.

Q. You never did? A. No, sir. What we call C. P. ammonia certainly contains no alumina or alumina compounds.

Q. It has a tendency to dissolve glass, has it not? A. Only when extremely strong.

Q. Does it act stronger when it is not diluted than when it is diluted? A. Yes, sir; it certainly does. The chances are that you can dilute it and that it will not have any appreciable effect in dissolving glass.

Q. You don't think it was there in such a strength that it would have any effect on the glass? A. No, sir; and I do not think it would have any effect whatever on the glass.

Q. And you say you did not, or you do not think that would have any appreciable effect whatever? A. No, I never knew alumina to pass into an analysis that way from glass used in the laboratory. It is simply beyond the question under the circumstances.

Q. That it would not pass into the analysis? A. Certainly that it could not.

Q. Did you test your carbonate of soda when you were separating your ferric oxide from the rest? A. Yes, sir.

Q. How? A. I dissolved it in hydrochloric acid and added ammonia.

Q. Now, Mr. Chauvenet you made another experiment regarding the solubility of the hydroxide of alumina in this same gestric juice did you not? A. Yes, sir; I did.

Q. How many grains did you get of oxide of alumina out of that? A. I got .75 of a grain.

Q. And in the other .2 of a grain? A. I did.

Q. Now, you got 25.9 per cent of the whole hydroxide of alumina you estimated in the experiment? A. I did.

Q. That is in the experiment with the bread? A. Yes, sir.

Q. And you got 24.5 in the second experiment? A. That is right.

Q. Well, I can't make out, Mr. Chauvenet, how you got the .75. As I understand it 25.9 is to .2 as 24.75 is to x? A. There was no experiment—no comparison between the experiments. I made no attempt at that. I started there with 3.05.

Q. Well, I am trying to find out, and if I am in error I want you to say so.

Mr. Cunningham: I object to counsel asking the witness to correct his (counsel's) errors.

The Court: They may explain it if they do not understand each other.

Q. Now you say that the amount was what? A. The amount of hydroxide of alumina soluble in the bread was .772.

Q. Now, then if you had taken .772 instead of 3.05 I don't see how you ascertained the proportion? A. I made no attempt to ascertain any proportion.

Q. Well, I don't understand you then? A. Had I taken .772 the same amount or rather the same number of grains of alumina the final weight would not have been .75.

Q. But in one case you got a greater solubility than in the other? A. Yes, sir; it was slightly greater.

Q. Does the .1934 equal 25.9 of .772. There is a calculation. Look at the proportion. Isn't 24.5 to .2 as 25.9 is to x? A. Just let me see that, my arithmetic may not be as good as my chemistry. I don't see that there is any relation between the two because there was no attempt at comparison.

Q. I am not speaking now of the relation. I want to get at the amount. I have three figures there of the proportion and want to get the fourth.

The Court: Did you consider that there was any ratio between them. I understood him to say that he tried one experiment and obtained a certain amount of soluble matter and he tried another experiment, under different circumstances and obtained a little different results. I do not see that there was any comparison between the two.

Mr. Cunningham: I seems to me it is a matter of arithmatic.

The Witness: If you will permit me to make a calculation I may be able to help you out.

The Court: As I understand the testimony of this witness his assumption of the amount in the bread was based

upon a theoretical calculation and not upon a direct determination.

A. I don't know whether this will answer your question or not but I have made a calculation here. Had I started in the second experiment with .772 grains of alumina I would have gotten .188 grains as the result, which I think you will find to be 24.5 per cent of soluble matter.

Q. Now you say that 80 grammes is 12.123 grains? A. Yes, sir.

Q. And you got two tenths of one grain of alumina as the result of your analysis? A. Yes, sir.

Q. Which would be about one six thousandths of the original amount of the bread? A. Yes, sir.

Q. Now is it not possible, Mr. Chauvenet in making chemical analyses that slight errors will be made so that results will vary in the hundredths or such matter? A. There is always ground for possible error due to dust in the air or to impurities in certain re-agents but the modern chemist does not allow for any error in the product because he has practically spent his lifetime reducing the re-agents and he knows just exactly what he has got so that in a modern laboratory there would be practically no errors except those which are so slight they would not be considered practical errors at all.

Q. Is it not possible that errors may occur when dealing with very minute quantities? A. Not with proper care being taken.

Q. This was an extremely small amount was it not? A. Two grains is not considered a small amount when you have balances on which you can weigh the one ten thousandth part of a milligrame.

Q. When you take into consideration that the result only equals one six thousandth part of the original solution you are considering a very difficult operation are you not? A. I should not consider that at all delicate, compared with the delicacy of many of our experiments.

Q. I counted twenty steps in your analysis as you described it and then when you spoke about separating the oxide of iron you said that was another long and difficult process. Now do you not think that possible error in some steps of this process would affect very materially such a result? A. The processes are long tis very true, but at the same time very

accurate and simply because it takes hours to run the solution to dryness that would certainly not affect the result.

Q. I am speaking of the number of steps you took. The changing of this material first into one thing and then into another backward and forward. Is'nt there a liability of error under those circumstances in dealing with small figures? A. No, because if there was any error it would be so infinitely small that you might multiply those steps and then it would not be appreciable.

Q. What is the difference between two tenths and eighteen one hundredths?

The Court: He stated one hundred and eighty-eight thousandths?

A. Then the difference would be twelve thousandths.

The Court: That represents the difference between the two analyses?

A. Yes, sir.

Q. Then why do you say that it is more soluble in the bread than in the other experiment? A. I distinctly stated that they were so nearly alike—so identical chemically that it was a remarkable fact. These analyses had no relation to each other except so far as they proved the solubility of the alumina under the circumstances.

Q. Can it be said to be an accurate analysis that takes so many steps when it is less than one-tenth of one per cent? A. I don't believe I really understand your question. You are still continuing to compare two results which have no relation to each other at all.

Q. Now, we will leave that subject and take up the question of your criticism of Dr. Smith's statements that alumina and aluminum compounds exist in drinking water. If I remember rightly you were asked by what authority you stated that there were no aluminum compounds in drinking water? A. If I remember rightly I stated that I had analyzed very many samples of drinking water and I have never been able to find more than a trace.

Q. You also stated, I believe, that you have read a great deal on the subject and that you were unable to find anyone who had reported it in any quantity in drinking water? A. Yes, sir.

Q. Did you hear Dr. Vaughn and Dr. Prescott testify? A. No, sir; I don't remember hearing their testimony.

Q. What do you say to their statements that there was some alumina present in drinking water? A. I do not know anything about their testimony and I will say that my experience has taught me and my reading on the subject teaches me that it is a very unusual thing to find out in drinking water at all. I do not think you will find alum once in a thousand cases. It is rare—exceptionally rare and I would be almost willing to state that instead of being found once in a thousand cases that it will not be found once in ten thousand cases.

Q. Notwithstanding what Dr. Prescott and Dr. Vaughn said on the subject?

Objected to as incompetent.

A. I do not remember what either of the gentlemen said on the subject.

Q. Now, Doctor, do you not think that the determination of the question whether any particular mixture is the true artificial gastric juice is a physiological question? A. It belongs to chemical physiology.

Q. Has a chemist ever analyzed what takes place in the human stomach? A. Yes; that has been done a thousand times.

Q. Does any living man know what takes place chemically in the human stomach? A. No; I think he does not.

Q. Does any living man know what is the exact constituents of the gastric juice as it actually exists in the human stomach? A. I do not know about the knowledge of all living men.

Q. I say of any living man? A. I do not know what they may know on that subject.

Q. Isn't the determination of that question something that belongs to the domain of physiological chemistry? A. Yes, sir.

Q. Are you competent to state the contents of the gastric juice of the stomach? A. I have stated to you the ingredients which if put together most nearly approximates the gastric juice in the stomach.

Q. Isn't it a fact that a man should be learned in physiological chemistry in order to ascertain those questions? A. Not necessarily. He may only be a chemist and yet learn it thoroughly.

Q. Are you more competent than any other analytical chemist to ascertain what is the true gastric juice of the human stomach? A. No.

Q. In your examination you stated that if there was an excess of alum in the baking powder it would exist in the bread and you were asked whether it would be soluble in the bread taken as food and you answered yes. Now the question as to whether or not it would be soluble in the human stomach is a physiological question is it not? A. It would largely depend upon a chemical analysis for its final determination.

Q. But it is a physiological question? A. Yes, sir.

Q. Now, are you aware that Mr. Layton, the prisoner here, is charged with a misdemeanor, the consequences of which will affect his liberty? A. Yes, sir.

Q. Now, if the fact of the solubility of alum in the human stomach affects that question would you still state as a positive fact that alum is soluble in the human stomach?

Mr. Cunningham: It seems to me that he has already pursued every legitimate line of inquiry with this witness and I submit that the question is entirely incompetent.

The Court: I will sustain the objection on the ground that the court has already ruled on a similar objection made by counsel for the defense on the ground that the witness is not qualified as a physiological expert.

Q. What is the color of aluminum hydrate, Mr. Chauvenet? A. That depends upon circumstances. When freshly precipitated it is of a dull grey color of the ordinary albumen. As dryness slowly progresses and it loses water it gets darker and darker in color until when it is about stiff enough to stand inversion in the bottom of the glass it is a very dark gray. Whether this dark gray color is due to any peculiarity of the salt itself, that is to say whether it is in the salt itself or whether it is due to slight particles of dust in the air I can not tell you.

Q. Do you know that this is pure that you have in this bottle here (exhibiting witness a bottle)? A. I do.

Q. That is rather of a dark color is it not? A. I can not account for its dark color except it be from long exposure from being evaporated in a flask with the mouth open. It is possible that had that not been so it might have been whiter. I think it is to a great extent interfered with by the atmosphere in which it is produced, taking up dust particles from the air or something of that kind.

Q. I suppose when it drys it shrinks more and more and becomes smaller in size? A. Yes, sir; that depends upon being exposed and allowed to dry.

Q. And I suppose it depends in a great measure on the heat to which it has been subjected? A. Very much.

Mr. Cunningham: The State announces that it will now rest its case in rebuttal.

Judge Seddon: The defense will not have anything to offer in surrebuttal.

This was all the evidence offered.

This case coming on for further consideration on Saturday, the 31st day of March, 1900, pursuant to adjournment, the defendant prayed the following instructions:

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 1 for the defendant.

The Court declares the law to be that if the Court, sitting as a jury in this case, finds from the evidence that the manufacture and sale of alum baking powders had existed in this State as an independent trade or business for a period of nearly twenty years prior to the 20th day of August, 1899.

That at that time and for many years prior thereto, in this State and in the United States, these powders have been well recognized articles of commerce and such trade had become a well established industry in which large sums of money had been invested and from which large numbers of persons gained their livelihood.

That in this State and the United States such powders were and are generally dealt in by grocers and are largely consumed by the public, and have generally proved themselves to be acceptable to such consumers and were and are in general useful and wholesome adjuncts to be used in the preparation of bread, or other articles of food in the preparation of which they are used.

And that the defendant at the time he sold the can of powder described in the information in this case was and had been long engaged in this trade as his pursuit in life, and sold said can in pursuance of his said trade, then the defendant is not guilty of the charge made against him in this case and must be acquitted.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 2 for the defendant.

The Court declares the law to be that if the Court, sitting as a jury in this case, finds from the evidence that the manufacture and sale of alum baking powders had existed in this State as an independent trade or business for a period of nearly twenty years prior to the 20th day of August, 1899.

That at that time and for many years prior thereto, in this State and in the United States, these powders have been well recognized articles of commerce and such trade has become a well established industry in which large sums of money had been invested and from which large numbers of persons gained their livelihood.

That in this State and the United States such powders were and are generally dealt in by grocers and are largely consumed by the public, and have generally proved themselves to be acceptable to such consumers and were and are in general useful and wholesome adjuncts to be used in the preparation of bread and other articles of food in the preparation of which they are used.

And that the defendant at the time he sold the can of powder described in the information in this case was and had been long engaged in this trade as his pursuit in life, and sold said can in pursuance of his said trade, then the defendant was engaged in a lawful business and was not guilty of a violation of any law of Missouri.

And the fact that the Court, sitting as a jury, may believe from the evidence that from want of skill or from carelessness or from dishonesty, some manufacturers engaged in said trade have at times put upon the market alum baking

powders which contain an excess of alum as compared with their bicarbonate of sodium ingredient, or otherwise improperly made, does not render the said trade of the defendant unlawful.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 3 for the defendant.

The Court declares the law to be that if the manufacture and sale of alum baking powders was a well established trade or business in this State at and long prior to the 20th day of August, 1899, and that if such business was in its general nature and scope an innocent business and generally useful and beneficial to the public in a generally useful and wholesome and well recognized article of commerce largely used by and acceptable to the people of Missouri, and that if the defendant had been long engaged in said business as his pursuit in life and manufactured and sold the can of alum baking powder described in the information in this case in the pursuit of his said business, then he is not guilty as charged and must be acquitted.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 4 for the defendant.

The Court declares the law to be that if the manufacture and sale of alum baking powders was a well established trade or business in this State at and long prior to the 20th day of August, 1899, and that if such business was in its general nature and scope an innocent business and generally useful and beneficial to the public and in a generally useful and wholesome and well recognized article of commerce largely used by and acceptable to the people of Missouri, and that if the defendant had been long engaged in said business as his

pursuit in life and manufactured and sold the can of alum baking powder described in the information in this case in the pursuit of his said business, then the fact that the court may believe from the evidence that from want of skill or from carelessness or from dishonesty some manufacturers engaged in said trade, have at times put upon the market some alum baking powders which contain an excess of alum as compared with their bicarbonate of sodium ingredient or otherwise improperly made, does not render said trade of the defendant unlawful.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 5 for the defendant.

The Court declares the law to be that when a citizen of the State of Missouri is charged with doing an act which he has done in pursuance of a long and well established business in which he is engaged, he can not be prevented from showing that such business is an innocent one and beneficial to the public by any mere act of the law making power of this State, and the declaration of such law making power in such act that he is engaged in an unlawful business is not conclusive upon this court of that fact, and it is the duty of this court to hear the evidence on the real nature of such business and of such charge and to determine for itself such real nature and declare the law valid or invalid according to the evidence adduced before it.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

Instruction No. 6 for the defendant.

The Court declares the law to be that if the Court sitting as a jury, finds from the evidence that at and long prior to the 20th of August, 1899, alum baking powders were well recog-

nized articles of commerce in Missouri, and that such alum baking powders made with ordinary skill when used in cooking with ordinary care, do not cause the food cooked with them to carry any alum into the stomach of the person eating the food, then the defendant is not guilty of the charge made against him in this case and must be acquitted.

The Court refused each and all of said instructions so offered by the defendant. To the action of the Court in refusing said instructions, and in refusing each one of them, the defendant then and there, at the time of refusing each of said instructions duly excepted. And the Court also, on said 31st day of March, 1900, sustained each and all of the specific objections hereinbefore noted in this bill of exceptions made by the plaintiff during the trial to the introduction of the testimony offered by the defendant and which at the different times when they were made the Court took under advisement, then announcing that it would hear said testimony subject to said objections, and would rule upon the objections and the admissibility of the testimony so offered and so objected to, after all the testimony should have been heard, all of which appears in this bill of exceptions and are specifically referred to.

The Court on the 31st day of March, 1900, and at the end of said case sustained all of the said objections of the plaintiff to the defendant's evidence. To the action of the Court in so sustaining said objections and each of them the defendant then and there at the time duly excepted.

When the defendant began the introduction of his testimony in his defense, as appears heretofore in this bill of exceptions and hereinbefore set out, the plaintiff objected generally to the introduction of any evidence by the defendant in his behalf on the ground that in view of the stipulation made between the parties, which was read, as appears in this bill of exceptions, by the plaintiff in presenting its prima facie case, all evidence which might be offered by the defendant in his defense would be irrelevant and immaterial. The Court, at the time plaintiff made said objection, announced that it would not then rule upon said objection, but would hear the evidence to be offered by the defendant subject to said objection, and would then, at the end of the case, announce its ruling and if it concluded that said objection of the plaintiff was well taken would rule out all of such evidence. And all

the evidence, offered by defendant in his defense was heard subject to said objection, as was so stated at the time by the Court, and at the conclusion of all of the evidence, on the 31st day of March, A. D. 1900, the Court ruled that it would sustain said objection, and did then and there rule out all of said evidence of the defendant and instructed the Court, sitting as a jury, in reaching a verdict in this case to disregard all of the evidence offered by the defendant in his defense and heard by the Court subject to said objection, as appears by this bill of exceptions, on the ground that all of said evidence was irrelevant and immaterial to the issues in this case.

To the action of the Court in sustaining said general objection of the plaintiff to all of the evidence of the defendant and ruling that said Court, sitting as a jury, in reaching its verdict should disregard all of such evidence, the defendant then and there at the time of making said ruling duly excepted.

And the Court on said 31st day of March, 1900, having fully considered said case on the evidence of the plaintiff in chief alone and the written arguments presented by both parties, found the defendant guilty in the manner and form charged in the information filed in this case and assessed his penalty at the sum of one hundred dollars. To which action of the Court, in making said finding and assessing said penalty, the defendant then and there, at the time of making the same duly excepted.

And on Monday, the 2d day of April, 1900, and within four days of said finding and assessment of punishment, the defendant filed his motion for a new trial as follows:

State of Missouri,)
) ss.
City of St. Louis.)

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

In the St. Louis Court of Criminal Correction.

Now comes the above named defendant, Whitney Layton, and moves this court to set aside the verdict and finding of this

Court, sitting as a jury made on March 31, 1900, and to grant unto defendant a new trial in this case, and alleges as grounds therefor the following reasons:

I.

The Court erred at the trial in refusing to give legal and proper instructions as to the law asked by the defendant.

II.

The Court erred at the trial in not giving instructions as to the law of its own motion, fully covering the issues in the case.

III.

Because the Court erred in excluding legal, proper and competent testimony, which was offered at the trial by the defendant.

IV.

Because the Court erred in excluding all of the testimony offered by the defendant in his defense at the trial.

V.

Because the Court erred in its ruling that it could hear no testimony on the part of the defendant offered by him for the purpose of showing that the law under which he was prosecuted, and on which the information in this case was based, was unconstitutional and erred in holding that all of said evidence offered by him for that purpose was immaterial and incompetent.

VI.

Because the Court admitted on behalf of the plaintiff illegal, improper and incompetent testimony.

VII.

Because the said verdict and finding of the Court, sitting as a jury, is contrary to the law, and also contrary to the evidence and contrary to the weight of the evidence.

VIII.

Because the said verdict and finding of the Court, sitting as a jury, is not supported by any evidence.

IX.

Because the Court under the evidence in the case in not declaring the statute of Missouri entitled "An Act to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article used, or to be used, in the preparation of food," approved May 11, 1899, purporting to prohibit any person or corporation doing business in this tate, to manufacture, sell or offer to sell any article, compound or preparation for the purpose of being used or which is intended to be used in the preparation of food, in which article, compound or preparation there is alum to be void in so far as it purported to prohibit the defendant from manufacturing, selling or offering to sell the article described in the information in this case, and the Court erred in declaring the said law to be valid and binding on the defendant in that respect.

X.

Because the verdict and finding of this Court, sitting as a jury, is against the defendant when it should have been in his favor.

SEDDON & BLAIR,
Attorneys for the defendant.

And thereafter, to-wit, on Saturday, the 7th day of April, 1900, the Court overruled defendant's said motion for new trial. To which action of the court in so overruling said motion for new trial the defendant then and there at the time of so overruling the same duly excepted. Thereafter and on the same day, to-wit, the 7th day of April, 1900, the defendant filed his motion in arrest of judgment as follows:

State of Missouri,)
) ss.
City of St. Louis.)

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

In the St. Louis Court of Criminal Correction.

Now comes the defendant, Whitney Layton, and moves this Court to arrest the judgment in this case for the following reasons:

First: The facts stated in the information do not constitute a public offense.

Second: The verdict herein is insufficient to sustain a judgment in this case.

SEDDON & BLAIR,
Attorneys for Defendant.

And thereafter and on the same day, to wit, the 7th day of April, 1900, the Court overruled said motion in arrest of judgment. To the action of the court in so overruling said motion for arrest of judgment, the defendant then and there, at the time of so overruling the same, duly excepted. And thereafter on said 7th day of April, A. D. 1900, the Court made its order extending the time in which the defendant might file his bill of exceptions to thirty days from the 7th day of April, 1900, which order is as follows:

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day comes defendant by his attorneys, and on his motion the Court orders that he shall have leave to file his bill of exceptions within thirty days from April 7, 1900.

Thereafter and on the same day, to-wit, Saturday the 7th day of April, 1900, the defendant filed his affidavit for appeal as follows:

State of Missouri,
vs.
Whitney Layton.

Charged with manufacturing and selling compounds, etc.

And now comes the defendant in the above entitled cause, who being first duly sworn upon his oath says: That the appeal in the above entitled cause is not made for vexation or delay, but because affiant believes that the appellant is aggrieved by the judgment or decision of the Court.

Whitney Layton.

Sworn to and subscribed before me, this 7th day of April, 1900. A. J. WAGENMAN, Clerk.

And at the same time of filing said affidavit for appeal, the defendant prayed the Court to grant him an appeal from the judgment of this Court to the Supreme Court of the State of Missouri. The Court then and there fixed the penalty of the defendant's appeal bond in the sum of $500. Whereupon the defendant presented his appeal bond to the Court, which was duly approved, and the Court made its order granting to the defendant an appeal from the judgment of this Court to the Supreme Court of the State of Missouri, as follows:

April 7, 1900.

State of Missouri, Plaintiff,
vs.
Whitney Layton, Defendant.

On charge of manufacturing and selling compounds, etc.

Now at this day again comes the prosecuting attorney for the State and the defendant in his own proper person also

comes. Wherefore it is considered by the Court that the said defendant for said offense and in pursuance of the finding of the Court aforesaid pay to the State of Missouri for the use of the city of St. Louis a fine of $100 together with costs herein accrued. Thereupon again comes the defendant by his attorney and prays an appeal from the judgment of this Court to the Supreme Court of the State of Missouri, and the Court being of the opinion that there is probable cause for such appeal doth grant the same, and defendant having filed his affidavit for appeal and appeal bond with good and sufficient securities to be aproved by the court, it is ordered by the Court that this appeal shall operate as a supersedeas until this cause shall be heard and determined by the Supreme Court of the State of Missouri.

To the end that the foregoing matters herein set forth may become a part of the record, the defendant prayed that this bill of exceptions might be signed and sealed by the judge of this Court, which was done on this 25th day of April A. D., 1900. WILLIS H. CLARK [Seal].

Judge of the St. Louis Court of Criminal Correction.

April 21, 1900.

The foregoing bill of exceptions is correct.

EDWARD CUNNINGHAM, JR.,
Of Counsel for the State.

SEDDON & BLAIR,
Of Counsel for the Defendant.

State of Missouri,)
) ss.
City of St. Louis.)

I, Alfred J. Wagenman, Clerk of the St. Louis Court of Criminal Correction, do hereby certify that the above and foregoing is a full, true and complete transcript of the record and proceedings had in said Court in the cause of the State of Missouri, Plaintiff, vs. Whitney Layton, Defendant, as fully as the same remains of record and on file in my office.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seal of said Court at office in the city of St. Louis this —— day of —— in the years of our Lord, 1900.

————————————, Clerk.

676 And afterwards, to wit, on the 8th day of October, 1900, the said appellant files his statement and brief, which said statement and brief are in words and figures as follows, viz:

In the Supreme Court of Missouri, October Term, A. D. 1900.

STATE OF MISSOURI, Respondent,
vs.
WHITNEY LAYTON, Appellant.

Appeal of Whitney Layton from the judgment of the St. Louis court of criminal correction.

Statement and Brief of the Appellant, Whitney Layton.

Statement.

The defendant was charged by an information filed in the St. Louis court of criminal correction with manufacturing and
677 selling in the city of St. Louis, Missouri, on the 28th day of August, 1899, a can of baking powder containing alum as an ingredient.

STATE OF MISSOURI, }
City of St. Louis, } *ss:*

In the St. Louis Court of Criminal Correction.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Charged with manufacturing and selling compounds intended to be used in preparation of food. Sess. Acts 1899, page 170.

ST. LOUIS, *August* 30, 1899.

Richard Johnson, assistant prosecuting attorney, of the St. Louis court of criminal correction, now here in court, on behalf of the State of Missouri, information makes as follows:

That Whitney Layton in the city of St. Louis, on the 28th day of August, 1899, then and there doing business in this State, did unlawfully manufacture, sell and offer to sell a certain compound and preparation, to wit: Layton's health food baking powder, which said compound and preparation was so manufactured and sold for the purpose of being used and was intended by said Layton to be used in the preparation of food in which said compound and preparation so manufactured and sold there was alum. Contrary to the form of the statute in such case made and provided, and against the peace and dignity of the State.

RICH. M. JOHNSON,
Ass't Pros. Att'y of the St. Louis Court of Crim. Correction.

678 The prosecution was based upon an act of the legislature of Missouri, approved by the governor May 11, 1899, which is as follows:

"An act to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any articles used or to be used in the preparation of food."

"Be it enacted by the General Assembly of the State of Missouri, as follows:

"SECTION 1. That it shall be unlawful for any person or corporation doing business in this State to manufacture, sell or offer to sell, any article, compound or preparation, for the purpose of being used, or which is intended to be used, in the preparation of food, in which article, compound or preparation, there is any arsenic, calomel, bismuth, ammonia or alum.

"SECTION 2. Any person or corporation violating the provisions of this act shall be deemed guilty of a misdemeanor and shall, upon conviction, be fined not less than one hundred dollars, which shall be paid into and become a part of the road fund of the county in which such fine is collected.

"Approved May 11th, 1899. Takes effect August 22d, 1899."

The defendant having waived a jury the case came on for trial before the lower court sitting as a jury. At the trial the State read the following stipulation:

STATE OF MISSOURI, } *ss.*:
City of St. Louis, }

In the St. Louis Court of Criminal Correction.

STATE OF MISSOURI, Plaintiff, }
vs.
WHITNEY LAYTON, Defendant. }

For the purpose only of the trial of this cause and at said trial the defendant Whitney Layton for a stipulation covering
679 a part of the facts in the above-entitled case, admits that in the city of St. Louis, Missouri, on the 28th day of August, 1899, he, the defendant, then and there doing business in the State of Missouri did manufacture sell and offer to sell to J. M. Houston Grocer Company, then doing business at said city, a certain compound and preparation, to wit: one case containing two dozen, one-pound cans of baking powder, known and designated as Layton's health food baking powder, which said compound and preparation, so manufactured — sold and offered for sale by him for the purpose of its being used and was intended by defendant and by said J. M. Houston Grocer Company to be used in the preparation of food.

Defendant further admits that in said compound and preparation

so manufactured, sold and offered to be sold by him there was alum, and that the fact that the same contained alum was then well known to defendant; and it is further agreed and stipulated that at the trial of this case either party may offer any other evidence not inconsistent with the above facts which he may deem material, relevant and competent in the case, subject to objection by the other party to its materiality, relevancy or competency.

STEWART, CUNNINGHAM & ELIOT, WITH
H. A. CLOVER, JR.,
Prosecuting Attorney, for Plaintiff.
SEDDON & BLAIR,
STANLEY STONER,
Attorneys for Defendant.

The prosecution then rested its case.

The defendant then offered the evidence for his defense. The State objected to the introduction of any evidence by the defendant on the ground that in view of the stipulation read in evidence by the plaintiff, all other evidence in the case was incompetent, immaterial and irrelevant. At the time of making this objection the court announced that it was not ready then to rule upon the objection, that it would hear the evidence subject to the objection, and would reserve its ruling until the end of the trial. The de-
680 fendant then proceeded to introduce his evidence subject to said ruling. From time to time plaintiff renewed its objection in the foregoing form. At the time of each of said objections the court made the same ruling. To all these rulings the defendant at the time duly excepted. At the end of the trial, on motion of the plaintiff, the court sustained all of said objections, and ruled out all of the evidence which the defendant had offered in his defense, on the ground that all of the same was wholly incompetent, immaterial and irrelevant. At the end of the trial the defendant also asked the court to give the following instructions:

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 1 for the Defendant.

The court declares the law to be that if the court, sitting as a jury in this case, finds from the evidence that the manufacture and sale of alum baking powders had existed in this State as an independent trade or business for a period of nearly twenty years prior to the 20th day of August, 1899.

That at that time and for many years prior thereto, in this State and in the United States, these powders have been well-recognized articles of commerce and such trade had become a well-established

industry in which large sums of money had been invested and from which large numbers of persons gained their livelihood.

That in this State and the United States such powders were and are generally dealt in by grocers and are largely consumed by the public, and have generally proved themselves to be acceptable to such consumers and were and are in general useful and wholesome adjuncts to be used in the preparation of bread, or other articles of food in the preparation of which they are used.

And that the defendant at the time he sold the can of powder described in the information in this case was and had been long engaged in this trade as his pursuit in life, and sold said can
681 in pursuance of his trade, then the defendant is not guilty of the charge made against him in this case and must be acquitted.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 2 for the Defendant.

The court declares the law to be that if the court, sitting as a jury in this case, finds from the evidence that the manufacture and sale of alum baking powders had existed in this State as an independent trade or business for a period of nearly twenty years prior to the 20th day of August, 1899.

That at that time and for many years prior thereto, in this State and in the United States, these powders have been well-recognized articles of commerce and such trade has become a well-established industry in which large sums of money had been invested and from which large numbers of persons gained their livelihood.

That in this State and the United States such powders were and are generally dealt in by grocers and are largely consumed by the public, and have generally proved themselves to be acceptable to such consumers and were and are in general useful and wholesome adjuncts to be used in the preparation of bread and other articles of food in the preparation of which they are used.

And that the defendant at the time he sold the can of powder described in the information in this case was and had been long engaged in this trade as his pursuit in life, and sold said can in the pursuance of his said trade, the *the* defendant was engaged in a lawful business and was not guilty of a violation of any law of Missouri.

And the fact that the court, sitting as a jury, may believe from the evidence that from want of skill or from carelessness or from dishonesty, some manufacturers engaged in said trade have at times put upon the market alum baking powders which contain an
682 excess of alum as compared with their bicarbonate of sodium ingredient, or otherwise improperly made, does not render the said trade of the defendant unlawful.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 3 *for the Defendant.*

The court declares the law to be that if the manufacture and sale of alum baking powder was a well-established trade or business in this State at and long prior to the 20th day of August, 1899, and that if such business was in its general nature and scope an innocent business and generally useful and beneficial to the public in a generally useful and wholesome and well-recognized article of commerce largely used by and acceptable to the people of Missouri, and that if the defendant had been long engaged in said business as his pursuit in life and manufactured and sold the can of alum baking powder described in the information in this case in the pursuit of his said business, then he is not guilty as charged and must be acquitted.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 4 *for the Defendant.*

The court declares the law to be that if the manufacture and sale of alum baking powders was a well-established trade or business in this State at and long prior to the 20th day of August, 1899, and that if such business was in its general nature and scope an innocent business and generally useful and beneficial to the public and in a generally useful and wholesome and well-recognized article of commerce largely used by and acceptable to the people of Missouri, and that if the defendant had been long engaged in said business as his pursuit in life and manufactured and sold the can of alum baking powder described in the information in this case in the
683 pursuit of his said business, then the fact that the court may believe from the evidence that from want or skill or from carelessness or from dishonesty some manufacturers engaged in said trade, have at times put upon the market some alum baking powders which contain an excess of alum as compared with their bicarbonate of sodium ingredient or otherwise improperly made, does not render said trade of the defendant unlawful.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 5 *for the Defendant.*

The court declares the law to be that when a citizen of the State of Missouri is charged with doing an act which he has done in pursu-

ance of a long and well-established business in which he is engaged, he cannot be prevented from showing that such business is an innocent one and beneficial to the public by any mere act of the law-making power of this State, and the declaration of such law-making power in such act that he is engaged in an unlawful business is not conclusive upon this court of that fact, and it is the duty of this court to hear the evidence on the real nature of such business and of such charge and to determine for itself such real nature and declare the law valid or invalid according to the evidence adduced before it.

STATE OF MISSOURI, Plaintiff,
vs.
WHITNEY LAYTON, Defendant.

Instruction No. 6 for the Defendant.

The court declares the law to be that if the court sitting as a jury, finds from the evidence that at and long prior to the 20th of August, 1899, alum baking powders were well-recognized articles of commerce in Missouri, and that such alum baking powders made
684 with ordinary skill when used in cooking with ordinary care, do not cause the food cooked with them to carry any alum into the stomach of the person eating the food, then the defendant is not guilty of the charge made against him in this case and must be acquitted.

All of said instructions were refused by the court. The defendant duly excepted to all of said rulings.

The court having ruled out all of said evidence of the defendant's, and having refused all said instructions, then found the defendant guilty in the manner and form charged in the information, and having overruled the defendant's motion for a new trial and his motion in arrest, it sentenced the defendant to a fine of $100, "to be paid into the treasury of the city of St. Louis," and not, as the constitution directs, for the benefit of school funds. This error in the form of the judgment, we presume that this court can correct, and that it is not therefore very material to us.

The court, therefore decided the case upon the foregoing stipulation of the parties as the sole evidence in the case.

The evidence which was offered by defendant in his defense, and which was ruled out by the lower court, not only tended to establish, but clearly established the following facts, of most of which being matters of common notoriety, this court would have taken judicial cognizance, irrespective of any evidence.

Baking powders have been in use for more than fifty years. They are intended to furnish to the people a simple, cheap, efficient, and wholesome leavening agent in the cooking of food, as a substitute for yeast, which is a very slow and more expensive leavening agent, and one which requires considerable intelligence in the cook to use successfully. All baking powders furnish this leavening agent in

the form of carbon dioxide (carbonic acid gas), which is given off from the baking powder in preparing and cooking food. This gas being liberated in the dough, forms bubbles which take permanent form in the baked bread, thus making it light and porous. All baking powders in their essential features are the same.

685 They all supply this leavening agent (dioxide of carbon), by freeing it from bicarbonate of soda. They differ in the non-essential manner in which this carbon dioxide is released from the bicarbonate of soda. There are three classes of baking powders known to commerce, viz: The cream of tartar baking powders, the phosphate baking powders and the alum baking powders.

The cream of tartar powders are composed of bicarbonate of soda and cream of tartar (bitartrate of potassium), mixed with starch as a filler. The soda and cream of tartar are combined in such proportions that when they are united together in the presence of water, in the process of cooking, they react upon each other, and free the carbon dioxide which leavens the bread. The resulting product left in the bread after cooking is Rochelle salts, a purgative agent.

In the phosphate powders the active agent is the phosphate of calcium which unites with the bicarbonate of soda and liberates the dioxide of carbon, the leavening agent.

The alum powders, as they do not differ from the cream of tartar powders in the main essential feature of a baking powder, to wit, the liberation of the carbon dioxide from bicarbonate of sodium, but merely in the non-essential mode of liberating the gas, do not differ from each other essentially. In the phosphate alum powders, phosphate of calcium is used to aid in liberating from the bicarbonate of soda the gas, the leavening agent, the essential thing.

The straight alum baking powders are composed of bicarbonate of soda and a double sulphate salt of sodium and aluminum, which technically is not alum at all but is popularly called soda alum, with starch as a filler or carrier. The alum and the bicarbonate of soda are mixed in such proportions that in the cooking process the carbon dioxide is released as a leavening agent, as in the case of the cream of tartar baking powders. The resulting products are sulphate of sodium and hydroxide (hydrate) of aluminum.

The evidence of the defendant tended to show that none

686 of the products left in the food cooked with alum baking powder are at all injurious to the human system.

The evidence shows that the trade in alum baking powders as a trade has given entire satisfaction to the people. Alum baking powders are nearly as standard an article as flour or sugar. They are to be found upon the shelves of every grocery store, not only in Missouri but in the United States. They were first introduced about 1870. In spite of the fiercest competition and most hostile rivalry upon the part of manufacturers of cream of tartar powders, who the evidence shows have used every effort to prejudice the mind of the public by every manner of false advertisements and representations, the trade rapidly expanded until it has now reached vast propor-

tions. The evidence shows that alum baking powder sold in the United States last year amounted to not fewer than 120,000,000 pounds and involved an enormous expenditure in the manufacture and distribution.

The defendant's evidence also tended to show that not only was the particular can of baking powder, known as "Layton's health food" for the sale of which he was prosecuted, but also all alum baking powders in general are and always have been healthful and wholesome adjuncts in the preparation of human food. The evidence shows conclusively that no one had ever either heard of, or had known of, a single case where the health of a single human being had been injured or had been supposed to have been injured by the use of alum baking powder in the preparation of food, and that the trade in alum baking powders as a trade prior to the passage of this law was an honest and lawful business in a generally harmless, and useful preparation used as an adjunct in the cooking of food. The manufacturers and sellers of both such powders, cream of tartar and alum, have been engaged in competition with each other in furnishing to the people from bicarbonate of soda a leavening agent for cooking bread, cakes, etc. They differ only in the non-essential manner of freeing the gas. The trade in cream of tartar powders has been practically monopo-
687 lized by the Royal Baking Powder Co. which controls the cream of tartar market. We do not complain of this fact, but we do call attention to the fact that side by side have existed and now exist two trades, both honest and lawful. One with its immense investments is struck down by an arbitrary enactment of the law. Its destruction can only enure to foster the rival industry and give it a practical monopoly. The practical monopoly of an industry such as the baking-powder business in this country can mean only the acquisition of immense wealth. The court cannot close its eyes to the effect of the law in ascertaining its purpose.

Nearly all of these facts, certainly all of them which are necessary to sustain the defendant's case, are matters of public notoriety of which the court will take judicial knowledge just as it will take judicial knowledge of the history of the trade in salt.

But the court in its rulings declared that it made no difference how lawful was the calling of the defendant before the passage of this law, nor how innocent and useful was the article in which he dealt, the legislature was the sole judge of its powers, when it assumed to exercise its police power in the matter of food, and that in the exercise of said powers it might prohibit any article of food; that the court could not consider or weigh any evidence to show that baking powders are wholesome and useful adjuncts of food, and that the trade in them is a wholesome, honest and useful trade. Nor could the court even take judicial cognizance of such facts. Upon the same reasoning if the law had forbidden the use of common table salt in the preparation of food, the court would have considered itself bound under the stipulation read in evidence to convict

the defendant of selling common table salt. The principle of the ruling of the court is that in the matter of foods at least the legislature is a conclusive judge of its own police powers.

688 BRIEF.

I.

Assignment of Errors.

The court erred in ruling out all of the evidence which was offered by the defendant in his defense.

Second. The court erred in refusing the instructions which were offered by the defendant.

Third. The court erred in refusing to declare that the law under which the defendant was convicted was unconstitutional and void.

Fourth. The court erred in finding against the defendant.

II.

POINTS.

A.

The act in question conflicts with the provision of section 28, article 4 of the constitution of Missouri, which provides that no bill "shall contain more than one subject which shall be clearly expressed."

Kansas *v.* Payne, 71 Mo. 159.
State *v.* Burgdoefer, 107 Mo. 1.

B.

The constitution of Missouri (bill of rights, sec. 4) provides "that all persons have a natural right to life, liberty and the enjoyment and the gains of their own industry and that to
689 give security to these is the principal office of government." And section 30, article II (bill of rights), provides that no one shall be deprived of life, liberty or property without due process of law." Under these provisions the defendant, Whitney Layton, as every other citizen of Missouri, has the equal right that every other citizen has of assuming his ordinary calling or trade in any wholesome and well-established article of commerce and as the law under which he is convicted forbids him to pursue such a calling it is unconstitutional and void.

2 Hare on Constitutional Law, p. 772.
Toledo Railway Co. *v.* City, 67 Ills. 37.
Mugler *v.* Kansas, 123 U. S. 661.
Taylor *v.* Bronson, 4 Hill, 144.
In re Jacobs, 98 N. Y. 98.
People *v.* Marx, 99 N. Y. 377.
People *v.* Arensberg, 105 N. Y. 123.

The following are differentiated and discussed:
Powell *v.* Commonwealth, 127 U. S. 678.
State *v.* Addington, 77 Mo. 110.

C.

The evidence offered by the defendant and ruled out by the court brought to the attention of the court the fact that the trade in which the defendant was engaged was a lawful business, being the manufacturing and selling of a well-recognized article of commerce of almost universal acceptance after a test of more than twenty-five years of experience. This fact was a matter of common notoriety of which the court should have taken judicial cognizance. The fact that some people engaged in the business may or do commit frauds or by their want of skill or dishonesty injure others, does not render the business unlawful.

Tiedeman on Constitutional Law, p. 289.

690 D.

The law under which the defendant was convicted conflicts with the 14th amendment of the Constitution of the United States, which guarantees to every man the equal protection of the law.

State *ex rel.* Wyatt *v.* Ashbrook, 55 S. W. Rep. 627.

III.

ARGUMENT.

A.

The law in question conflicts with section 28, article IV of the constitution of Missouri, which provides that "no bill shall contain more than one subject which shall be clearly expressed."

The title of this bill is as follows:

"An act to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article used or to be used in the preparation of food."

The object of this constitutional provision is to make it clear to the legislators and the public from a reading of the title of any bill what are its contents. It is true that the constitution does not require or expect that the contents should be set forth except in very general terms, but its title must be a fair index, so that the people reading the title shall not be taken by surprise.

691 Judge Henry in Kansas *v.* Payne, 71 Mo. 159, says:

"Potter (J.) observed, the body of the bill expresses its objects. The title of the bill disguises and conceals it. No person from reading its title would ever guess its object. The object of the constitutional provision was to require so clear an expression of the subject of the bill in the title that it would at once apprise legisla-

tors and others interested of the precise subject of the proposed legislation." * * * "Who would have supposed from the title of the act that important provisions of the charter of Kansas City would be repealed or amended."

In State *v.* Burgdoerfer, 107 Mo. 1.

The court after expressing its opinion that by the words "clearly expressed" was not intended an exact definition and referring to the impossibility of giving any definite rule to govern every case in advance said: "The title must express the subject of the act in such terms that the members of the General Assembly and the people may not be left in doubt as to what matter is treated of. The terms of the title must be such as to unequivocally put every one upon inquiry into the contents of the bill."

The title to the act in question gave no fair intimation of the contents and no one reading the title would naturally expect to find in the body of the act any provision striking down the trade in alum baking powders which was of such enormous proportions and was so extended that alum baking powders were to be found on the shelves of every grocery store in this State, a trade which had been well established for twenty-five years in a well-recognized article of commerce, the innocent nature of which had been so well demonstrated by experience that it had almost universal acceptance and was used and approved by a majority of the people. It was evidently the sole intention of the legislature to prohibit the sale of alum baking powders. That will be the only result if the law is enforced. It is true that the law forbids the manufacture and sale of any article, compound or preparation for the
692 purpose of being used in the preparation of food in which there is any arsenic, calomel, bismuth, ammonia or alum. The insertion of the words arsenic, calomel, bismuth, shows the fraudulent purpose of the framers of the bill, and that the trade in alum baking powders was what was really and solely aimed at. The court will take judicial notice of the fact; if not, the evidence shows conclusively that neither arsenic, calomel or bismuth is ever or has ever been used in food, and that as a scientific fact they could not be used except with an intent to murder. They have no scientific relation to the preparation of food. Why should their use be prohibited except as a disguise to the intent of the framers of the bill. The only preparations which as a matter of fact are affected are the alum baking powders. Why was the intention disguised? Why did not the title express the real intention?

We can easily trace in this record the malign influence which conceived this iniquitous and stealthy measure, to the chief competitor of the traders in alum. And it was by reason of this influence the design was so disguised in the title that it could not be easily discovered and was not discovered by the thousands of our citizens who were engaged in the manufacture and sale of alum baking powders.

The evidence offered by the defendant, which was ruled out,

established and tended to establish and brought to the attention of the court the following facts of which the court will also take judicial cognizance. Alum baking powders are in common use by the people. They have been in such use for thirty years. They are consumed in such enormous quantities, that they are on the grocery shelves of practically every grocery store in the country. They have proven themselves by long experience acceptable as a common household article. They have stood the test of experience for thirty years or more. Though perhaps not so universally used as common table salt, these powders stand upon very much the same footing, as a wholesome adjunct to the cooking process. It is a
693 matter of common notoriety of common daily experience of the people that alum baking powders are in the main wholesome and useful. Their enormous consumption after years of experience, and their acceptance by the public after such experience demonstrates this fact conclusively. There are many so-called scientific men who oppose their use, but it is a noticeable fact, as shown by this record, that this opposition is generally stimulated by retainers from the principal trader in rival powders. Nothing seems to be so good that it does not escape the condemnation of some so-called scientific men. Some of them condemn the use of common table salt attributing to its use many of the ills of mankind. Others condemn the use of bread made from wheat, attributing to its large consumption the largely prevalent diseases of diabetes and constipation. We might extend these illustrations indefinitely, but we can safely waive aside all of these objections against the use of table salt as of no weight against the lessons of experience, and the lesson is the same in the case of alum baking powders as the case of table salt. After having been used for thirty years or more, 120,000,000 pounds of them would not have been sold in one year, if they were not wholesome and useful. The business of manufacturing and selling them was, therefore, an honest and lawful business. Such a business was not made unlawful because parties conducting it may or do commit frauds in it, or by their want of skill or honesty may injure others. But what trade or calling has not its liabilities to fraud and abuse and consequent injury? Flour is adulterated and so is sugar. Fish will generate ptomaine poison (a deadly poison), if not properly handled, and thousands have been killed by the carelessness and recklessness of dealers in fish. The illustrations might be accumulated.

This proposition is nowhere better stated than by Prof. Tiedemann in his book on Constitutional Limitations (p. 289):

"It has been so often explained and stated, that the police power must, when exerted in any direction, be confined to the imposition of those restrictions and burdens which are necessary
694 to promote the general welfare, in other words, to prevent the infliction of a public injury, that it seems to be an unpardonable reiteration to make any further reference to it. But the principle thus enunciated is the key to every problem arising out of the

exercise of police power. Applied to the question of prohibition of trades and occupations, it declares unwarranted by the constitution any law which prohibits altogether an occupation, the prosecution of which does not necessarily, and because of its unenviable character, work an injury to the public. It is not sufficient that the public sustains harm from a certain trade or employment, as it is conducted by some who are engaged in it. Nor is it sufficient that all remedies for the prevention of the evil prove defective, which fall short of total prohibition. Because many men engaged in the calling persist in so conducting the business that the public suffer, and their actions cannot otherwise be effectually controlled, is no justification of a law which prohibits an honest man from conducting the business in such a manner as not to inflict injury upon the public. In order to prohibit the prosecution of a trade altogether, the injury to the public, which furnishes the justification for such a law, must proceed from the inherent character of the business. Where it is possible to conduct the business without harm to the public, all sorts of police regulations may be instituted, which may tend to suppress the evil. Licenses may be required, the most rigid system of police inspection may be established, and heavy penalties may be imposed for the infractions of the law; but if the business is not inherently harmful, the prosecution of it cannot rightfully be prohibited to one who will conduct the business in a proper and circumspect manner. Such an one would be deprived of his liberty, without due process of law.

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"Fraud is a trespass upon the rights of others, and may, therefore, always be punished. When, therefore, a business consists necessarily in the perpetration of a fraud, the business may be prohibited,
695 although fraud furnishes no justification for the prohibition of a business, which is not necessarily fraudulent, but which only affords abundant facilities for the commission. Thus it has been held within the constitutional limitations of the power of a State legislature to prohibit the sale of adulterated milk, even though the adulteration is made with harmless materials, such as pure water. It may be said that a perfectly *bona fide* sale may be made of adulterated milk, but the position is hardly sustainable. Adulteration is essentially fraudulent, and serves no good purpose, and the sale of the adulterated article of food may be rightfully prohibited, although it produces no unwholesome effect. Sugars are now very commonly adulterated by the use of a harmless substance called glucose. There can be no doubt of the power of the State to make the sale and manufacture of adulterated sugar a misdemeanor, but the great difficulty that is experienced in detecting and suppressing this mode of adulteration would not justify the absolute prohibition of the sale and manufacture of sugars.

* * * * * * *

"An honest man cannot be denied the privilege of conducting the

business in an honest and lawful manner because dishonest men are in the habit of practicing gross and successful frauds upon those with whom they have dealings. If that were a justifiable ground for abolishing any business, many important, perhaps some of the most beneficial, employments and professions could be properly prohibited. There is no profession or employment that furnishes more abundant opportunities for the practice of frauds upon defenseless victims than does the profession of the law, and that profession has its ample proportion of knaves among its votaries, although the proportion is very much smaller than is popularly supposed. But it would be idle to assert that, because of the frequency of fraudulent practices among lawyers, the State could abolish the profession and forbid the practice of the law.

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696 "A still stronger ground for the total prohibition of a trade or business is when the thing offered for sale is in some way injurious or unwholesome. It is not enough that the thing may become harmful, when put to a wrong use. It must be in itself harmful, and incapable of a harmless use. Poisonous drugs are valuable when properly used, but they may work serious injuries by being improperly used, even to the extent of destroying life. But it would hardly be claimed that, on that account, their sale could be prohibited altogether. Safeguards of every kind can be thrown around the sale of them, so that damage will not be sustained from an improper use of them, but that is the limit of the police control of the trade. * * * So, also, the sale of milk which comes from cows fed in whole or in part upon still slops, may be prohibited, if it is true that such milk is unwholesome as human food. In the same manner a law was held to be constitutional, which prohibited the sale of illuminating oil which ignited below a certain heat. But it would be unconstitutional to prohibit altogether the sale of either of these things, if they could be employed in some other harmless and useful way. For example, the oil which was prohibited for illuminating purposes, may be very valuable and more or less harmless when used for lubricating purposes."

C.

But in this case the learned counsel will probably admit that the above statement of the law is correct but will urge that the legislature is the sole judge of what is a lawful calling and that if it professedly acts in the exercise of its police power, however unjust and arbitrary may be the enactment and whatever discrimination it may make between citizens, it is the conclusive judge of its own powers and that therefore the court has no power at all to inquire into the subject and as it is admitted that alum was in the powder sold, the court must rule out all the evidence of the defendant.

That any man should hold his life, liberty and property subject

to elict of any man or set of men, legislators or others, is so
697 monstrous a proposition that it must be sustained by unquestioned authority. There is no such authority.

The courts can at all times examine into the reasonableness of the acts of the legislature, ascertain its true extent, effect and purpose, and if it, in fact, unreasonably abridges the fundamental rights of any citizen, declare the law void whatever may be pretense under which the law was passed. It is not only their right but their duty to do so. There is nothing magical in the words "police power," to exclude the courts from an examination into the true construction and the real purpose and effect of any and every act of the legislature.

"The legislature cannot preclude the appropriate use of things innocent in themselves by stigmatizing them as poisonous, nor will a legislative declaration render that a nuisance which is not such within the legal definition of the term and according to the common experience of life and trade."

Hare on Const., vol. 2, page 772.

The court said in Ry. Co. *v.* City, 67 Ills. 37:

"Such regulations (police regulations) must be reasonable. What are reasonable regulations and what are subjects of police powers, must necessarily be judicial questions. The law-making power is the sole judge when the necessity exists, and when, if at all, it will exercise the right to enact such laws.

"Like other powers of government, there are constitutional limitations to its exercise. It is not within the power of the General Assembly, under pretense of exercising the police power of the State, to enact laws not necessary to the preservation of the health and safety of the community, that will be oppressive and burdensome on the citizen. If it should prohibit that which is harmless in itself * * * it would be the duty of the courts to declare such legislation void."

In Mugler *v.* Kansas, 123 U. S. 661, it was said:

"It does not at all follow that every statute enacted ostensibly
698 for the promotion of these ends is to be accepted as a legitimate exertion of the police powers of the State. There are, of necessity, limits beyond which legislation cannot rightfully go. While every possible presumption is to be indulged in favor of the validity of a statute (Sinking-fund cases, 99 U. S. 700, 718), the courts must obey the constitution rather than the law-making department of the Government, and must, upon their own responsibility, determine whether, in any particular case, these limits have been passed. The courts are not bound by mere forms nor are they to be misled by mere pretenses. They are at liberty, and indeed are under the solemn duty, to look at the substance of things whenever they enter upon the question whether the legislature has exceeded the limits of its authority. If, therefore, a statute purporting to have been enacted to protect the public health, the public

morals or the public safety, has no real or substantial relation to those objects, or is a palpable invasion of the rights secured by the fundamental law, it is the duty of the courts to so adjudge and thereby give effect to the Constitution."

Judge Bronson says, in Taylor *v.* Porter, 4 Hill, 144:

"Under our form of government the legislature is not supreme; it is only one of the organs of that absolute sovereignty which resides in the whole body of the people. Like other departments of the Government, it can only exercise such powers as have been delegated to it; when it steps beyond that boundary its acts, like that of the most humble magistrate in the State who transcends his jurisdiction, are utterly void. Where then shall we find a delegation of power to the legislature to take the property of A, and give it to B, either with or without compensation? Only one clause of the constitution can be cited in support of the power, and that is the first article where the people have declared that the legislative power of this State shall be vested in a senate and assembly. It is readily admitted that the two houses subject only to the qualified negative of the governor, possess all the legislative power of this State, but the question immediately presents itself, what is the legislative power, and how far does it extend? Does it reach the life,
699 liberty or property of a citizen who is not charged with a transgression of the laws, and when the sacrifice is not demanded by a just regard for the public welfare?"

Powers that can be justified only on this specific ground, that they are police regulations, and which would otherwise be clearly prohibited by the constitution, can be such only as are so clearly necessary to the safety, comfort, and well being of society, or so imperatively required by the public necessity as to lead to the rational and satisfactory conclusion that the framers of the constitution should not, as men of ordinary prudence and foresight, have intended to prohibit their exercise in the particular case, notwithstanding the language of the prohibition would otherwise include it. People *v.* Jackson, 9 Mich. 285.

In the matter of Jacobs, 98 N. Y. 98, the law passed was entitled: "An act to improve the public health by prohibiting the manufacture of cigars and preparations of tobacco in any form in tenement-houses in certain cases. Jacobs lived in a flat of four stories, with seven rooms on each floor. He occupied with his family, one of the floors, and used one of the rooms as his workshop for preparing tobacco and making the cigars, but there was no smell of tobacco in any part of the building, except in that room. He was arrested under that law and brought a writ of *habeas corpus* for his discharge which was finally heard and decided by the court of appeals, and in giving their opinion the court say:

"'Generally it is not for the legislature to determine what laws and regulations are needed to protect the public health and secure the public comfort and safety; and while its measures are calculated, intended, convenient and appropriate to accomplish these ends, the

exercise of its discretion is not subject to review by the court. But they must have some relations to these ends. Under the mere guise of police regulations, personal rights and private property cannot be arbitrarily evaded, and the determination of the legislature is not final and conclusive. If it passes an act ostensibly for the
700 public good and thereby destroys or takes away the property of a citizen, and interferes with his personal liberty, then it is for the courts to scrutinize the act, and see whether it really relates to and is convenient and appropriate to promote the public health. It matters not that the legislature may, in the title to the act, or in its body, declare that it is intended for the improvement of the public health. Such a declaration does not conclude the courts, and they must yet determine the fact declared, and enforce the law.' "

D.

These principles are peculiarly applicable to cases where the real purpose and effect of the law as in this case is to destroy one industry for the benefit of another.

As has been said by a learned author:

" Laws passed depriving one class of citizens of their rights for the purpose of benefiting another class are of the most tyrannical and pernicious character, and are usually enacted under some specious pretext of protecting the public health, promoting the general welfare, and always in virtue of the police power of the government. If it is competent for the legislature in the exercise of its police power, to prohibit or suppress the manufacture or production of any particular production of food, trade or commerce on the pretense that it is injurious to the public health, morals or general welfare of the people, where there is no apparent cause or reason for such action, and the courts are not allowed to question the assumption, it is a monstrous power, subversive of our liberties and of all our cherished rights under the Constitution. It practically nullifies the bill of rights and the principles enunciated in the Declaration of Independence, depriving us of our property, liberty and pursuit of happiness. Under this decision, it would seem that to prevent the court from inquiring into the validity of such enactment, however unwarranted, it is only necessary that the title should express an object of police regulation, and that the act itself should be
701 carefully drawn to conceal its real purpose. If so drawn it must under this decision be held a proper exercise of the police power, and not in conflict with any provision of the Constitution, however flagrantly it might affect private rights and property.

" To illustrate, let us apply the doctrine here advanced to two springs of mineral water located in the State of Wisconsin. One of them, the Bethesda, is well known and in extensive use in this country, yielding a princely income to its owners, a syndicate of capitalists and politicians capable of widely influencing the legislation of the State. The other spring, known as the Delevan lithia, is just

rising into public notice and prominence, possessed of characteristics that may enable it in time to supplant the popularity of the Bethesda, and thereby become a serious competitor for the supply of the wants of the public. The owners of both springs are engaged in bottling, impregnating and selling their waters. Let us suppose that the able syndicate of the Bethesda, seeing the danger which might threaten, should apply to the legislature of Wisconsin for a law prohibiting the bottling, carbonizing or selling of the Delevan lithia water, or the having it in possession with intent to sell making the violation of such statute a misdemeanor punishable by fine and imprisonment; and in order to bring it effectually within the principle of the oleomargarine decision we will suppose that the law was entitled, 'An act for the protection of public health, and to prevent adulteration of mineral waters, and fraud in the sale thereof;' and the legislature should comply with their request and enact the proposed statute. A conviction under such a statute would in all respects resemble the present case and would be no more flagrantly in violation of the Constitution." This author continues: "The fact that the Delevan lithia water is not injurious to the public health, but on the other hand, entirely wholesome, promotive of health, and a powerful remedial agent, could form no ground for setting it aside as in conflict with the Constitution, notwithstanding the manifest and openly avowed object of procuring its pas-
702 sage was to benefit the Bethesda syndicate, and prevent a diminution of their revenues by competition. If such is the proper construction of the police power, it would seem that our constitutional provisions for preserving our rights and property are of little avail for that purpose against it.

"To carry this doctrine to its legitimate conclusion, let us suppose that the legislature of the State of New York could be induced to pass an act with the pretentious title that it was for the preservation of the public health, etc., providing that the owners of Congress spring should no longer bottle or dispose of the waters thereof, and that to have it in possession in bottles, with intent to sell it for use as a beverage, should be a crime, subjecting the owners to fine and imprisonment, would not the principle contended for extend to such a case and forbid the court from inquiring into its validity, or whether it was in conflict with the fourteenth amendment of the Constitution, for the reason that it was a proper police regulation for the public health?"

These authorities clearly establish in reference to the acts of the legislature purporting to be passed in the exercise of its general police powers, that if the true intent and purpose of the act is, not to protect the health, morals, and welfare of the public but to foster one industry by destroying another lawful competing one, the law is void, and that it is the duty of the court to examine into all the facts of the case and to ascertain from the evidence, applying the proper tests, what is the true intent of the law, and that the courts cannot be shut off from such inquiry by any mere declaration of the

law-makers either in the preamble of the law or in its body as to their true intent.

E.

No discussion of this subject can be complete without a reference to what is known as the oleomargarine cases.

It will doubtless be contended by the counsel for the State
703 that whatever may be the law with reference to the exercise of the police powers in other cases, these cases conclusively establish that in the matter of food, at least, the legislature has exclusive jurisdiction, and that its fiat that an article offered is injurious, is absolutely conclusive of the subject. They will be forced to state the proposition wide enough to embrace all foods. For, if the court must, without investigation, and merely because of this "fiat," declare the use of alum in baking powders injurious, contrary to any possible evidence on the subject, on principle it must declare the same as to any other prohibited article of food.

It would be a very remarkable thing that the oleomargarine cases, or any other class of cases when properly understood, should conflict with the settled principles of law which we have above laid down, generally applicable to all cases of the exercise of the police powers. We are confident that they do not, but that they fully confirm our statement drawn from these authorities that a law prohibiting the use of any food which is not in fact and "substance" intended to protect the public health or morals, but to foster one industry by destroying another, is void, and that it is the duty of the court to ascertain the real purpose and effect of the law. The leading oleomargarine cases in New York bring out these principles with clearness.

People *v.* Marx, 99 N. Y. 377, was the first of these—here a law which prohibited the manufacture or sale of any oleomargarine substances other than those produced from unadulterated milk or cream to be used in any article designed to take the place of butter. The court declared this law unconstitutional for the reason that the purpose of the law when construed in the light of the facts and circumstances surrounding its enactment, was not to protect the public health, morals, or welfare, but to foster one industry at the expense of another lawful one, which was prohibited.

The court did not confine the evidence to the question whether
the particular article sold was wholesome, which was quite
704 consistent with the fact that the trade generally was bad, but heard the evidence upon the nature of the trade as a whole.

Rapallo, J., said:

"It appears to us quite clear that the object and effect of the enactment under consideration was not to supplement the existing provisions against fraud and deception by means of imitation of dairy butter, but to take a further and bolder step, and by absolutely prohibiting the manufacture or sale of any article which could be used as a substitute for it, however openly and fairly the character of the

substitute might be avowed and published, to drive the substituted article from the market, and protect those engaged in the manufacture of dairy products, against the competition of cheaper substances, capable of being applied to the same uses, as articles of food.

"The learned counsel for the respondent frankly meets this view, and claims in his points, as he did orally upon the argument, that even if it were certain that the sole object of the enactment was to protect the dairy industry in this State against the substitution of a cheaper article made from cheaper materials, this would not be beyond the power of the legislature. This we think is the real question in the case."

* * * "No proposition," says Rapallo, J., "is now more firmly settled than that it is one of the fundamental rights and privileges of every American citizen to adopt and follow such lawful industrial pursuit, not injurious to the community, as he may see fit. Live Stock Ass'n *v.* The Crescent City, etc., 1 Abb. (U. S.) 398; Slaughter-house cases, 16 Wall. 106; Corfield *v.* Coryell, 4 Wash. C. C. 380; Matter of Jacobs, 98 N. Y. 98. The term 'liberty,' as protected by the Constitution is not cramped into a mere freedom from physical restraint of the person of the citizen, as by incarceration, but is deemed to embrace the right of man to be free in the employment of the faculties with which he has been endowed by his Creator, subject only to such restraints as are necessary for the common welfare. In the language of Andrew, J., in Berthoif *v.* O'Reilly, 74 N. Y. 515, the right to liberty embraces
705 the right of man 'to exercise his faculties and to follow a lawful avocation for the support of life,' and as expressed by Earl, J., in *In re* Jacobs, 'one may be deprived of his liberty, and his constitutional right thereto violated, without the actual restraint of his person. Liberty in its broad sense, as understood in this country, means the right not only of freedom from servitude, imprisonment, or restraint, but the right of one to use his faculties in all lawful ways, to live and work where he will, to earn his livelihood in any lawful calling, and to pursue any lawful trade or avocation.'

"Who will have the temerity to say that these constitutional principals are not violated by an enactment which absolutely prohibits an important branch of industry for the sole reason that it competes with another, and may reduce the price of an article of food for the human race?

"Measures of this kind are dangerous, even to their promoters. If the argument of the respondent in support of the absolute power of the legislature to prohibit one branch of industry for the purpose of protecting another with which it competes can be sustained, why could not the oleomargarine manufacturers, should they obtain sufficient power to influence or control the legislative councils, prohibit the manufacture or sale of dairy products? Would arguments then be found wanting to demonstrate the invalidity under the Constitution of such an act? The principle is the same in both cases. The numbers engaged upon each side of the controversy cannot influence the question here. Equal rights to all are what are intended to be

secured by the establishment of constitutional limits to legislative power and impartial tribunals to enforce them.

"Illustrations might be indefinitely multiplied of the evils which would result from legislation which should exclude one class of citizens from industries lawful in other respects, in order to protect another class against competition. We cannot doubt that such legislation is violative of the letter, as well as of the spirit, of the
706 constitutional provisions before referred to, nor that such is the character of the enactment under which the appellant was convicted."

(See also People *v.* Gillson, 17 N. E. Rep. 343 (N. Y.); 109 N. Y. 389; People, Moxley *v.* Pease, 30 Chicago Legal News, 277 (circuit Ct. Cook Co.); Dorsey *v.* State, 40 L. R. A. 201; 44 S. W. Rep. 514.)

The case of People *v.* Arensberg, 105 N. Y. 123, does show that the court will hear the evidence and when it can ascertain from the evidence that the true intent and purpose of the law is to protect the public in their health, morals, or welfare, the law is valid.

Here a law aimed at preventing the sale of oleomargarine "in imitation of butter" was held valid—on this rests the distinction between the (Arensberg) case and the Marx case. The court (Rapallo, judge) said:

"The statute under consideration in the Marx case, was held to be unconstitutional for the reason that the prohibition was not confined to unwholesome or simulated substances, but absolutely prohibited the manufacture or sale of any compound designed to be used as a substitute for butter or cheese, however wholesome or valuable, or however openly and fairly the character of the substance might be avowed or published; that the act could not, therefore, be regarded as a health law, nor as intended to prevent deception by the sale of a simulated article as genuine; and stress was laid in the opinion upon the fact that the prohibition was not of the manufacture or sale of an article designed as an *imitation* of dairy butter, but of an article designed to take the *place* of dairy butter, however dissimilar in color or appearance the artificial product might be to ordinary dairy butter." (The italics in the above quotation are those of the court.)

In the next paragraph Rapallo, J., takes the affirmative position that the statute is valid because it in terms prohibits imitations and fraud upon the public.

"Assuming, as is claimed, that butter made from animal
707 fat or oil is as wholesome, nutritious and suitable for food as dairy butter; that it is composed of the same elements and is substantially the same article, except as regards its origin; and that it is cheaper, and that it would be a violation of the constitutional rights and liberties of the people to prohibit them from manufacturing or dealing in it, for the mere purpose of protecting the producers of dairy butter against competition—yet it cannot be claimed that the producers of butter made from animal fats or oils have any constitutional rights to resort to devices for the purpose of making their

product resemble in appearance the more expensive article known as 'dairy butter,' or that it is beyond the power of the legislature to enact such laws as they may deem necessary to prevent the simulated article being put upon the market in such a form and manner as to be calculated to deceive. If it possesses the merits which are claimed for it, and is inocuous, those making and dealing in it should be protected in the enjoyment of liberty in those respects; but they may legally be required to sell it for and as what it actually is, and upon its own merits, and are not entitled to the benefit of any additional market value which may be imparted to it by resorting to artificial means to make it resemble dairy butter in appearance. It may be butter, but it is not butter made from cream, and the difference in cost or market value, if no other, would make it a fraud to pass off one article for the other."

To same effect are:

Cook *v.* State, 110 Ala. 40;
Stalz *v.* Thompson, 44 Minn. 271;
State *v.* Marshall, 64 N. H. 549.
State *v.* Myers, 42 W. Va. 832.
Butler *v.* Chambers, 36 Minn. 69.
State *v.* Newton, 50 N. J. L. 534.
Commonwealth *v.* Huntley, 156 Mass. 236.
State *v.* Hogan, 55 Minn. 183.
People *v.* Citraid, 73 Hun. 457.

708 In the Marx case the statute was declared invalid. In the oleomargarine cases of Powell *v.* Commonwealth, 127 U. S. 678, and in State *v.* Addington, 77 Mo. 110, statutes entirely similar to that of New York and considered in the Marx case were declared valid. These results were reached not by reason of any difference in the principles involved but because the cases were presented on different states of facts. For in the Powell case the court said:

"The main proposition advanced by the defendant is that his enjoyment upon terms of equality with all others in similar circumstances of the privilege of pursuing an ordinary calling or trade, and of acquiring, holding and selling property, is an essential part of his rights of liberty and property, as guaranteed by the fourteenth amendment. The court assents to this general poposition as embodying a sound principle of constitutional law."

And there is nothing in the Addington case to the contrary to this.

In the Powell and Addington cases the evidence was restricted solely to showing that the particular article sold was wholesome and pure. This left open the question whether the trade in itself was injurious and deceptive. For it might well be that the particular article was an exceptional one and that the trade was injurious and deceptive in its nature. Inasmuch as there was no evidence on this subject and the court had no judicial knowledge on the subject brought home to it by satisfactory evidence the presumption that

the legislature had acted within its jurisdiction to protect the public in their health and from deception could but prevail.

If there had been evidence sufficient to satisfy the mind of the court in the Powell case as in the Marx case that the trade in oleomargarine was not injurious or deceptive and that the real motive was to destroy one trade to foster its rival, it is safe to infer that a different conclusion would have been reached. For Justice Harlan says:

709 "It will be observed that the offer in the court below was to show by proof that the particular articles the defendant sold, and those in his possession for sale, in violation of the statute, were, in fact, wholesome or nutritious articles of food. It is entirely consistent with that offer that many, indeed, that most kinds of oleomargarine butter in the market contain ingredients that are or may become injurious to health. The court cannot say, from anything of which it may take judicial cognizance, that such is not the fact."

And in the next paragraph he says:

"And as it does not appear upon the face of the statute, or from any facts of which the court must take judicial cognizance that it (the statute) infringes rights secured by the fundamental law, the legislative determination of those questions (viz: whether the absolute prohibition of oleomargarine is necessary in order to protect the public health, etc.) is conclusive upon the courts."

The same criticism may be made of the cases of State *v.* Addington (*supra*) and State *v.* Wright, 41 Atl. 795, in which not the slightest evidence was introduced as to the wholesomeness and fairness of the trade at large. As Judge Sherwood said in the Addington case you cannot upset a quarantine law because a particular ship has a clean bill of health.

F.

The act of Missouri in question cannot be defended on the ground that its purpose was to prevent fraud upon the public by "imitations." The title of the act if it has any legitimate purpose shows conclusively that it was passed solely to prevent the use of "unhealthy chemicals or substances in the preparation or manufacture of any article used or to be used in the preparation of food." If it cannot be supported on the ground of the protection of public health it cannot be supported at all. The fact that while the proposed object of the law was to protect the health of the people against the use of unhealthy chemical substances in the prep-

710 aration of food, the law classes alum with certain virulent poisons as arsenic, calomel and bismuth which never were and never could be used in the preparation of food, places beyond the range of doubt the conclusion drawn from the other evidence that the protection of the public health was a mere pretense to deprive thousands of their lawful livelihood that a single corporation may be proper and be enriched. It is a fundamental proposition of law needing no citation of authorities to support it, that a statute is

like any other writing in the matter of its construction, and that we can look to its terms to ascertain in the light of the evidence its true purport and meaning.

6.

This statute not only conflicts with the provisions of the Constitution which guarantees to him his life, liberty and property and that he shall not be deprived of them without due process of law, but it especially conflicts with that clause of the 14th amendment to the Constitution of the United States which provides that no State shall deny to any person the equal protection of the law. It is class legislation of the most vicious character, and in this respect especially does it differ from the oleomargarine cases. Judge Harlan, in the Powell case, admitted that if the law under discussion was class legislation a different conclusion would have been drawn. He said, Powell *v.* Penna. 127 U. S. 687:

"This statute places under the same restrictions all who manufacture or sell, or offer for sale, or keep in possession, the articles prohibited. Thus recognizing the principle of equality among those engaged in the same business."

In the recent department store case of State of Missouri *v.* Wyatt, not yet officially reported but to be found in full in the Globe-Democrat of February 21, 1900, the court said:

"If the terms, life, liberty and property, as used in the Constitution are 'representative terms, and cover every right to which a member of the body politic is entitled under the law,'
711 as said by Sherwood, J., in State *v.* Ludlow, 129 Mo. 172, and that within this comprehensive scope are embraced the right to buy and sell as others may; and to pursue such honest calling, vocation or business as the citizen may choose, subject only to such restraints on the imposition of such burdens as may be required or imposed for the general good, and, if 'due process of law' is to be defined as 'the law of the land,' designed to protect and preserve the rights of the citizen against arbitrary legislation, as well as against arbitrary executive or judicial action, then 'due process of law' is denied, when any particular person of a class or of the community are singled out for the imposition of restraints or burdens not imposed upon and to be borne by all of the class, or of the community at large, unless the imposition or restraint be based upon existing distinctions that differentiate the particular individuals of the class to be affected, from the body of the community, and this question as to whether the persons thus designated constitutes a natural or reasonable class depends upon facts which the court passing upon the validity or invalidity of the legislation must determine upon. While the legislature, under its vested authority and power, may arbitrarily impose taxes, restraints and burdens of various kinds, within the constitutional limits prescribed, that may become most onerous and oppressive to the citizen, which the courts can do naught but uphold, it cannot create conditions or fiat classes,

that will operate to make legislation alone applicable to those artificial conditions and classes, as general law within the meaning of the Constitution; or that will entitle it to the designation of 'the law of the land,' or that will make the act 'due process of law,' by which alone the liberty of the citizen may be restrained, or his property burdened or disposed of."

The same principles have been frequently stated by the same court.

The courts cannot divide the baking-powder trade into two classes upon an artificial distinction and strike down one branch to
712 foster another—its rival. Both sets of people are furnishing to the public carbon dioxide to be used as a leavening agent in the making of bread, both furnish it by liberating the gas from bicarbonate of soda, in the same manner, save the one set use alum and the other use bitartrate of potassium as the liberating agents. Both are harmless agents as they are commonly used, both may possibly become harmful when they are improperly used. The one in such case may furnish with the carbon dioxide free alum not proven but possibly an injurious agent in the manner taken with bread. The other may in such case furnish with the corbon dioxide, Rochelle salts, an active pugative, in too large quantities. One set of manufacturers of alum powder use phosphate of calcium to aid in the liberation of the gas. But this is an immaterial fact and no classification can be based upon it. In the same manner no real distinction can be made between the two harmless liberating agents, alum and bitartrate of potassium. The legislature may as well say that one man may drive nails with a hammer and another shall not drive nails with a hatchet. The instrumentalities are for some purpose absolutely distinct but for the purpose of such a law identical.

Mr. Justice Bradley, in Butchers' Union *v.* Crescent City, 111 U. S. 757, said, in speaking of legislative enactments under the exercise of the police power encroaching upon the right of every person to pursue his lawful calling:

"If by legislative enactment they can be carried into the common avocations of life so as to cut off the right of the citizen to choose his avocation, the right to earn his bread by the trade which he has learned; and if there is no constitutional means of putting a check to such enormity, I can only say that it is time that the constitution was still further amended. In my judgment, the present constitution is amply sufficient."

The law is but the application of the principles of justice guided by common sense, and we confidently expect that this court will find our present constitution "amply sufficient" to protect the citizens of this State from the perpetration of this "monstrous wrong under the forms and pretense of law."

Respectfully submitted,

SEDDON & BLAIR AND
STANLEY STONER,
Attorneys for the Defendant.

713 And on the same day, the said appellant also files his reply, which said reply is in words and figures as follows, to wit:

In the Supreme Court of Missouri, Division No. 2, October Term, 1900.

STATE OF MISSOURI, Respondent,
vs.
WHITNEY LAYTON, Appellant.

Appeal from St. Louis court of criminal correction.

Appellant's Reply.

May it please the court:

Before proceeding to reply to the argument of the State, it may, perhaps, be more convenient for the court if we briefly restate the appellant's contentions. Appellant relies upon the unconstitutionality and the invalidity of the law upon which the judgment is based.

That statue, we say, is unconstitutional—

1st. Because it is in direct conflict with section 28 of article IV of the constitution of Missouri, which provides that no bill shall contain more than one subject, which shall be clearly expressed in its title.

714 2d. Because it violates the guaranties of the constitutions of the State of Missouri and of the United States, in that it deprives the appellant of his liberty and of his property without due process of law.

3d. Because the law, by its terms, is not passed for the prevention of fraud upon the public, or as a protection to the public health.

4th. Because it is an unwarranted exercise of the police power of the State, for it protects and fosters one industry, *i. e.*, the manufacturer of cream of tartar baking powder, by granting to it a monopoly of the baking-powder business in the State of Missouri, by the absolute prohibition and destruction of its competitors, *i. e.*, the manufacturers and dealers in baking powder containing alum.

5th. Because it prohibits, altogether, an occupation and enormous business, the prosecution of which works no one any injury, and which furnishes to the citizens of Missouri a cheap and wholesome article or ingredient of food.

I.

The title to the act is a deception and a fraud upon the public.

In our original brief we attempted to demonstrate that the title to the act was apparently drafted with the intent and purpose of deceiving the public and the legislators, in that, from the title we must infer that it was sought to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article

used, or to be used, in the preparation of food, while in the body of the act we find the words "arsenic," "calomel," "bismuth," "ammonia" and "alum," used to designate "unhealthy chem-
715 icals or substances." Arsenic, calomel and bismuth are well known poisons, and are never, as the evidence shows, used in the preparation of food. On the other hand, it appears conclusively from the evidence in this case that for thirty years alum has been used as one of the constituents of baking powder. Notwithstanding the most diligent efforts of counsel for the State, in the preparation and trial of this case, we submit that the record may be searched in vain for any testimony, whether it be that of a chemist, a physician, or a layman, to the effect that alum, as used in baking powder, has, as a matter of fact, ever proved injurious or deleterious to health. It is true that the State, with the assistance of the learned chemist of the manufacturers of cream of tarter baking powder, has, by great diligence, and at great expense, introduced the testimony of expert chemists and physicians, which tends to show that alum *per se*, when taken raw in too large doses, and especially when injected into the blood, may prove injurious. No witness could swear that such a case had ever come within his personal experience, observation or knowledge. In such experiments as these experts claim to have made there is a total absence of any testimony to the effect that, in any case, free alum has ever been found to have entered the stomach from the consumption of food made with alum baking powder.

Dr. Vaughan, perhaps the chief witness for the State, and the only physiological chemist introduced by it, in answer to questions put to him by the court, was compelled to admit (Rec., 499) that his opinion as to the deleterious effects of alum baking powders was based entirely upon theory. That, in his twenty-five years' experience as a physician and physiological chemist, he not only never had in his private practice, but further, that he had never heard or read of a single case where any injurious effects could be attributed to the use of alum baking powder.

716 Yet, it appears from the record that alum baking powder has been a well-known and well-recognized ingredient of food for upwards of thirty years, and that the average sales of alum baking powder throughout the United States for the past few years have been in the neighborhood of 120,000,000 pounds per annum.

We therefore say that the title of the act in question is a fraud upon the public in that the subject thereunder embraced is not clearly expressed, because it classifies as "unhealthy chemicals or substances in the preparation of food" an article which, in thirty years of constant and almost universal use, has never been known, in the preparation of food, to be "an unhealthy chemical or substance."

But, more than this, under this same title are classified at least three well-known and well-recognized poisons. We, therefore, reassert that it was not the intent of the framers of this bill to clearly express in its title the subject, but that the bill was designed and intended as a fraud and a disguise.

Exception is taken to our assertion that we can easily trace in this record the malign influence which "conceived this iniquitous and stealthy measure to the chief competitor of the traders in alum." Surely this statement is amply borne out by the record, for it appears from the testimony of nearly every witness introduced by the State that he was engaged to testify in this case and his expenses were paid by the chief chemist of the Royal Baking Powder Company. (See testimony of Mallett, Rec., 395; Prescott, Rec., 448; Vaughan, Rec., 495; and others.) But that the passage of this act was procured by the cream of tartar baking powder interest, we submit, is manifested, not only by the active participation of that interest in this prosecution, but an analysis of the act itself will admit of no other conclusion. Let us look into the purposes of the act.

717 II.

A statute having for its manifest purpose the protection of the public health or the prevention of fraud upon the public is valid. A statute passed merely for the protection and fostering of one branch of an industry by prohibiting another branch of the same industry is invalid.

Perhaps in no cases is this distinction better defined than in
People *v.* Marx, 99 N. Y., 377 (2 N. E., 29), and
People *v.* Arensberg, 105 N. Y., 123 (11 N. E., 277).

These cases were decided by the New York court of appeals within two years of each other. The opinion in both was written by the same judge. In the Marx case one section of a statute relating to the manufacture and sale of oleomargarine was held invalid, because it was passed not for the purpose of preventing deception or for the protection of the public health, but because it prohibited the oleomargarine industry, for the sole purpose of protecting and fostering the manufacture and sale of dairy butter. In the Arensberg case another section of the same statute (amended) was held valid, because it was designed to prevent imitations and fraud upon the public.

In the Marx case the court held that the statute existed merely for the protection of those engaged in the manufacture and sale of dairy products manufactured from milk or cream. In that case it appeared from the testimony given on the trial that oleomargarine
butter was precisely as wholesome as dairy butter. This tes-
718 timony was, on motion of the district attorney, stricken out,
to which the defendant's counsel excepted. The State insisted that the manufacture or sale of any oleaginous compound, however pure and wholesome, as an article of food, if designed to take the place of dairy butter, was, by the act, made a crime. On the part of the defendant it was proved that there was practically no difference in the composition of butter and oleomargarine.

We again refer to the language of the opinion of Justice Rapallo, which, for convenience, we repeat:

"It appears to us quite clear that the object and effect of the enactment under consideration was not to supplement the existing provisions against fraud and deception by means of imitations of dairy butter; but to take a further and bolder step and by absolutely prohibiting the manufacture or sale of any article which could be used as a substitute for it, however openly and fairly the character of the substitute might be avowed and published, to drive the substituted article from the market and protect those engaged in the manufacture of dairy products against the competition of cheaper substances capable of being applied to the same uses as articles of food.

The learned counsel for the respondent frankly meets this view, and claims in his points, as he did orally upon the argument, that even if it were certain that the sole object of the enactment was to protect the dairy industry in this State against the substitution of a cheaper article made from cheaper materials, this would not be beyond the power of the legislature. This, we think, is the real question presented in the case. Conceding that the only limits upon the legislative power of the State are those imposed by the State constitution and that of the United States, we are called upon to determine whether or not those limits are transgressed by an enactment of this description. These limitations upon legislative power are necessarily very general in their terms, but are at the same time very comprehensive. The constitution of the State provides (article 1, § 1) that no member of this State shall be disfranchised or deprived of any of the rights and privileges
719 secured to any citizen thereof, unless by the law of the land or the judgment of his peers. Section 6 of article 1 provides that no person shall be deprived of life, liberty or property without due process of law. And the fourteenth amendment to the Constitution of the United States provides that 'no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States, nor shall any State deprive any person of life, liberty or property without due process of law, nor deny to any person within its jurisdiction the equal protection of the laws.' These constitutional safeguards have been so thoroughly discussed in recent cases that it would be superfluous to do more than refer to the conclusions which have been reached, bearing upon the question now under consideration. Among these no proposition is now more firmly settled than that it is one of the fundamental rights and privileges of every American citizen to adopt and follow such lawful industrial pursuit, not injurious to the community, as he may see fit. Live-stock Ass'n *v.* Crescent City, etc., 1 Abb., (U. S.), 398; Slaughter-house cases, 16 Wall., 102; Corfield *v.* Coryell, 4 Wash., D. C., 380; *In re* Jacobs, 98 N. Y., 98.

The term, liberty as protected by the Constitution, is not cramped into a mere freedom from physical restraint of the person of the citizen, as by incarceration, but is deemed to embrace the right of man to be free in the enjoyment of the facilities with which he has

been endowed by his Creator, subject only to such restraints as are necessary for the common welfare. In the language of Andrews, J., in Bertholf *v.* O'Reilly, 74 N. Y., 515, the right to liberty embraces the right of man 'to exercise his faculties and to follow a lawful avocation for the support of life,' and, as expressed by Earl, J., in *In re* Jacobs, 'one may be deprived of his liberty and his constitutional rights thereto violated, without the actual imprisonment or restraint of his person. Liberty, in its broad sense, as understood in this country, means the right not only of freedom from actual servitude, imprisonment or restraint, but the right of one to use his faculties in all lawful ways, to live and work where he will, to earn his livelihood in any lawful calling, and to pursue any law-
720 ful trade or avocation.' Who will have the temerity to say that these constitutional principles are not violated by an enactment which absolutely prohibits an important branch of industry for the sole reason that it competes with another, and may reduce the price of an article of food for the human race? Measures of this kind are dangerous, even to their promoters. If the argument of the respondents in support of the absolute power of the legislature to prohibit one branch of industry for the purpose of protecting another with which it competes can be sustained, why could not the oleomargarine manufacturers, should they obtain sufficient power to influence or control the legislative councils, prohibit the manufacture or sale of dairy products? Would arguments then be found wanting to demonstrate the invalidity under the constitution of such an act? The principle is the same in both cases. The numbers engaged upon each side of the controversy cannot influence the question here. Equal rights to all are what are intended to be secured by the establishment of constitutional limits to legislative power, and impartial tribunals to enforce them.

Illustrations might be indefinitely multiplied of the evils which would result from legislation which should exclude one class of citizens from industries, lawful in other respects, in order to protect another class against competition. We cannot doubt that such legislation is violative of the letter as well as of the spirit of the constitutional provisions before referred to, nor that such is the character of the enactment under which the appellant was convicted.

The judgment of the general term and of the court of sessions should be reversed."

In the Arensberg case, the court decided that a statute forbidding the manufacture or sale of products made in imitation or semblance of dairy butter was valid. The obvious reason for this decision being that the statute existed for the purpose of preventing the palming off on the public of oleomargarine in place of butter. In referring to the Marx case, the court said:

721 "That section (sec. 6) was held to be unconstitutional, for the reason that the prohibition was not confined to unwholesome or simulated substances, but absolutely prohibited the manufacture or sale of any compound designed to be used as a substitute

for butter or cheese, however wholesome or valuable, or however openly and fairly the character of the substance might be avowed and published; that the act could not, therefore, be regarded as a health law, nor as intended to prevent deception by the sale of a simulated article as genuine; and stress was laid in the opinion upon the fact that the prohibition was not of the manufacture or sale of an article designed as an imitation of dairy butter, but of any article designed to take the place of dairy butter, however dissimilar in color or appearance the artificial product might be to ordinary dairy butter."

And the court further says:

"Assuming, as is claimed, that butter made from animal fat or oil is as wholesome, nutritious, and suitable for food as dairy butter; that it is composed of the same elements, and is substantially the same article, except as regards its origin; and that it is cheaper; and that it would be a violation of the constitutional rights and liberties of the people to prohibit them from manufacturing or dealing in it, for the mere purpose of protecting the producers of dairy butter against competition—yet it cannot be claimed that the producers of butter made from animal fats or oils have any constitutional right to resort to devices for the purpose of making their product resemble in appearance the more expensive article known as 'dairy butter,' or that it is beyond the power of the legislature to enact such laws as they may deem necessary to prevent the *si*mulated article being put upon the market in such a form and manner as to be calculated to deceive. If it possesses the merits which are claimed for it, and is innocuous, those making and dealing in it should be protected in the enjoyment of liberty in those respects; but they may legally be required to sell it for and as what it actually is, and upon its own merits, and are not entitled to the benefit of any additional market value which may be imparted to it by resorting to artificial means to make it resemble dairy butter in appearance. It may be
722 butter, but it is not butter made from cream, and the difference in cost or market value, if no other, would make it a fraud to pass off one article for the other."

This distinction, so clearly defined by these two cases, between a statute passed to protect one industry by destroying another, and one passed to prevent fraud upon the public, is recognized in the case of Powell *v.* Pennsylvania, 127 U. S., 678.

In that case the validity, under the fourteenth amendment, of a statute which prohibited the manufacture or sale, out of any oleaginous substance other than that produced from unadulterated milk or cream, of an article designed to take the place of dairy butter, was questioned. Mr. Justice Harlan, in delivering the opinion of the court, says (page 684):

"The court * * * cannot adjudge that the defendant's rights of liberty and property, as thus defined, have been infringed by the statute of Pennsylvania without holding that, although it may have been enacted in good faith for the objects expressed in its title,

namely, to protect the public health and to prevent the adulteration of dairy products and fraud in the sale thereof, it has, in fact, no real or substantial relation to those objects. Mugler *v.* Kansas, 123 U. S., 623, 661. The court is unable to affirm that this legislation has no real or substantial relation to such objects."

However, Justice Harlan clearly indicated that if it had been made to appear to the court that the statute in question had destroyed the oleomargine industry solely in order to protect the manufacturers and sellers of butter, then it would have been invalid, as depriving persons of liberty and property. For, in defining the rights of liberty and property, he says:

"The main proposition advanced by the defendant is that his enjoyment upon terms of equality with all others in similar circumstances of the privilege of pursuing an ordinary calling or
723 trade, and of acquiring, holding and selling property, is an essential part of his rights of liberty and property as guaranteed by the fourteenth amendment. The court assents to this general proposition as embodying a sound principle of constitutional law."

In neither the Powell case nor the Mugler case, to both of which counsel for the State refer with so much confidence, was it shown or attempted to be shown that oleomargarine in general was not injurious to health. Counsel seem to wholly misapprehend this essential difference between the facts in those cases and the facts in the case at bar.

We submit, as indicated in our first brief, that by the two New York cases is clearly established the distinction between a statute which burdens one industry in order to protect another, and a statute which protects the public from unwholesome food or fraud. The distinction thus defined by the New York court of appeals has never, in any of the numerous oleomargarine cases, been shown to be erroneous. We, therefore, say, as a proposition of law, that a statute which absolutely prohibits one branch of an industry for the sole purpose of protecting another branch of the same industry is void, and that the statute under discussion is such a one. We subject that statute to a few tests.

III.

The tests by means of which it may be determined whether a statute exists for the protection of one industry at the expense of another, or is for the prevention of fraud upon the public or the protection of the public health.

The determination of the character of a legislative act, with reference to the distinction under discussion, depends in the first instance upon the wording of the statute itself.

724 If an inferior article is not naturally like another superior article, and when the statute forbids the manufacture or sale of the inferior article when it is made in "imitation" of the superior

article or requires the inferior article to be labeled in some way, the statute must be construed to be for the prevention of fraud upon the public, and hence valid.

This was held in the Arensberg case, wherein the statute prohibited the manufacture or sale of an article designed as an "imitation" of dairy butter.

Also, in the case of Cook *v.* State, 110 Ala., page 40 (20 So. Rep., 360), where a statute prohibiting substances made in "imitation" of butter was held valid.

Also, in Stolz *v.* Thompson, 44 Minn., 271 (46 N. W. Rep., 410).

In the latter case it was held that the legislature might require that baking powder containing alum be marked so as to indicate that fact.

In accordance with this rule all statutes requiring an inferior article naturally like another superior article to be in some way identified, for the prevention of fraud upon the public, must be sustained. See other cases, page 32, our original brief.

But if an inferior article not naturally like another superior article, or one commonly supposed to be superior, is absolutely prohibited, even though it be labeled or identified, so that it can deceive no one as to its true character, then its validity or invalidity will depend upon whether the article prohibited is, in general, injurious to the public health. This proposition has been well enunciated by Tiedman in his work on the "Limitations of Police Power," page 289.

We again refer to the language there used:

725 "It has been so often explained and stated that the police power must, when exerted in any direction, be confined to the imposition of those restrictions and burdens which are necessary to promote the general welfare, in other words to prevent the infliction of a public injury, that it seems to be an unpardonable reiteration to make any further reference to it. But the principle thus enunciated is the key to every problem arising out of the exercise of police power. Applied to the question of prohibition of trades and occupations, it declares unwarranted by the constitution any law which prohibits altogether an occupation, the prosecution of which does not necessarily, and because of its unenviable character, work an injury to the public. It is not sufficient that the public sustains harm from a certain trade or employment as it is conducted by some who are engaged in it. Nor is it sufficient that all remedies for the prevention of the evil prove defective, which fall short of total prohibition. * * * In order to prohibit the prosecution of a trade, altogether, the injury to the public, which furnishes the justification for such a law, must proceed from the inherent character of the business. Where it is possible to conduct the business without harm to the public, all sorts of police regulations may be instituted which may tend to suppress the evil. Licenses may be required, the most rigid system of police inspection may be established, and heavy penalties may be imposed for the infractions of the law; but if the business is not inherently harmful, the prosecu-

tion of it cannot rightfully be prohibited to one who will conduct the business in a proper and circumspect manner. Such an one would be (deprived of his liberty) without due process of law.

* * * * * * *

These principles have lately been presented for consideration and review in connection with laws prohibiting the manufacture and sale of a substance called oleomargarine, which resembles butter and is intended to be used instead, and to supply the place in trade of the dairy product. It is manufactured out of certain fatty deposits of the cow, which contain the same chemical properties as butter, varying only in degree. In New York and Missouri, and perhaps in other States, laws have been enacted pro-
726 hibiting absolutely the sale and manufacture of the oleomargarine. Although there has been some attempt made to show that this butter substitute is unwholesome as food, it seems now to be established by the most thorough chemical analyses that there is no unwholesome ingredient in unadulterated oleomargarine. If it were shown to be unwholesome as food, its sale for the purpose of human consumption could without doubt be prohibited, but the only valid objection to its sale is the close resemblance to genuine butter, and the consequent opportunity for the perpetration of fraud. And this was the sole ground upon which the constitutionality of the law was sustained by the supreme court of Missouri. (State *v.* Addington, 77 Mo., 117.)

But it is plain from the foregoing principles that a total prohibition of the sale of a thing cannot be justified on any such grounds. The sale must be necessarily fraudulent, in order to admit of its absolute prohibition. The law, therefore, which prohibits the sale of oleomargarine, granting that it is a wholesome article of food, is unconstitutional, and so it is decided by the New York court of appeals, in considering the validity of the New York statute. (People *v.* Marx, 99 N. Y., 370.) In the United States circuit court, the constitutionality of the Missouri statute was disputed in a petition by the party to the cause, who prayed for the intervention of the United States courts to prevent the enforcement of the law. The petition was denied, on the ground that the United States court had no jurisdiction, but in delivering the opinion of the court Justice Miller expressed the opinion that the law was in violation of the constitution of Missouri. The practice of deception in the sale of the oleomargarine may be made punishable as a misdemeanor, and the law may require, as in Ohio, the oleomargarine to be put up for sale in packages on which shall be distinctly and durably painted, stamped or marked the name of each article used or entering into the composition of such substance. A law has lately been proposed in New York by which every one dealing in oleomargarine is required to put up a sign to that effect, and in the manufacture of the substance it is required to be so colored that it may be
727 readily distinguished from pure butter. There can be no doubt as to the constitutionality of such laws, for their only

effect is the prevention of fraud. They do not interfere with the honest sale of a wholesome article of food."

The sole ground for the absolutely prohibitory statute to rest upon is that it is necessary for the protection of the public health. If, then, in the case at bar, it had only been proven that the particular article manufactured and sold by the appellant in this particular case was perfectly wholesome, there might be some force in the argument that the statute should be sustained; because the court, against the will of the legislature, might not be warranted in saying that, because Layton's baking powder was not deleterious to the public health, all baking powders containing alum were not injurious to the public health. For it might be well argued that the legislature had passed upon that question and found that the article prohibited was, in the main, unwholesome. But that is not this case. It appears in this record, by almost an avalanche of testimony—testimony given by disinterested witnesses who had abundant opportunity for investigating and knowing the matter about which they testified; testimony of witnesses, expert and lay; testimony of the proprietors of large hotels in Chicago, Kansas City and St. Louis, who had used alum baking powder for years; testimony of boarding-house keepers, and testimony of working-men and working-women from the factories, who had breathed and inhaled the dust from alum and alum baking powder of all kinds for years and years, that not only Layton's alum baking powder, but alum baking powders generally, are, and always have been, healthful and wholesome adjuncts in the preparation of human food.

All this testimony of those who have had actual experience in manufacturing, handling, dealing in and using alum baking
728 powders supplemented the physiological tests made under the supervision and direction of Dr. Austin Flint (Rec., 170), perhaps the most eminent physiologist in America. To the results of these physiological tests we will not take the time of the court to refer. Suffice it to say, that they demonstrated beyond a possibility of contradiction that no deleterious or injurious effects of any kind, nature or description resulted, or could result, from the use of alum baking powder in the preparation of food, and that the minute amount of the hydroxide of aluminum which enters the stomach neither disturbs digestion nor causes any departure whatever from normal conditions.

Much hypercritical objection to these tests made by Dr. Smith, under the supervision and direction of Dr. Flint, was attempted by the State. But we submit that this carping criticism, coming, as it did, from experts in the service of the chief manufacturer of cream of tartar baking powder, at fees from $50 to $100 per day (see cross-examination of Drs. Mallett, Prescott and Vaughan), from men who themselves had not only never made similar experiments, but whose knowledge of the effects and results thereof was purely theoretical and problematic, cannot be considered as of any weight against the facts established and the conclusions deducible from the great and

good work against which these highly paid servants of a rival industry urge their speculative theories.

Had it been within the range of possibilities for the State to have actually demonstrated by a series of physiological experiments the errors of Dr. Smith or Dr. Flint, or the unreliability of the facts established by them, is it reasonable to suppose that the State, having at its elbow in the preparation and trial of the cause that eminent chemist of the manufacture of cream of tartar powder, the zealous and resourceful Dr. McMurty, would not at least have made the attempt? If the theories of the State as to the deleterious
729 effects of alum baking powder were consistent and true, is it not reasonable to assume that, at least, some physiological evidence could have been adduced in support thereof? Time was ample, and expense no barrier. Evidence of this character, if, indeed, any such could be had, would have been much more satisfactory to the mind of a court than the deluge of theory, unsupported by anything within the knowledge or experience of the theorist, to which the court patiently listened for days.

There is not a scintilla of evidence, not even a hint or suggestion, in this whole record that any one ever heard of, much less knew of, a case where the health of a single human being had been injured by the use of alum baking powder in the preparation of food. And yet it appears that alum baking powder has been extensively used for upwards of thirty years, and that the entire output of alum powder in these United States per year is about one hundred and twenty millions of pounds.

We, therefore, insist that the legislature of the State of Missouri, in attempting to prohibit the use of alum in the preparation of food, far exceeded its constitutional power, and that whatever legal presumption which may have been indulged that the legislature has found alum unwholesome, is conclusively rebutted, not only by this record, but, to use the language of our distinguished adversary, "by common knowledge—self-evident facts—fact of which the court will take judicial notice; facts about which there is a general, common concensus of all intelligent persons; facts about which there is no dispute or difference of opinion among intelligent persons;" facts which irresistibly appeal to the sober judgment of the court, and to that of every honest, conscientious, thoughtful citizen of the State of Missouri.

As we have already seen, in the Marx case, the New York statute was held unconstitutional; in the Powell case the Pennsyl-
730 vania statute was sustained. It is not too much to say that these different decisions, respecting substantially the same statute, were reached, not because of any difference in the principles of constitutional law applied, but because of the different states of facts of which the two courts had judicial cognizance.

In the Marx case the evidence was not restricted to showing that the specific oleomargarine sold to the witness was perfectly pure and wholesome as an article of food, but it went to show that oleomarga-

rine in general was in no way injurious to the public health. The court held that evidence of this kind was relevant, because, it would irresistibly establish that the statute under consideration was passed, not for the protection of the public health, but for the protection of the manufacturers and sellers of dairy butter.

In the Powell case, evidence was offered to show the wholesomeness of the specific oleaginous substances, for the selling of which the defendant had been indicted. Mr. Justice Harlan, in his statement of the case, says:

"The defendant then offered to prove by Prof. Hugo Blanck, that he saw manufactured the article sold to the prosecuting witness that it was made from pure animal fats; that the process of manufacture was clean and wholesome," etc. (describing at length the manufacture and character of this specific oleomargarine which had been sold).

The court held that the evidence was irrelevant, for Justice Harlan said:

"It will be observed that the offer in the court below was to show by proof that the particular articles the defendant sold, and those in his possession for sale, in violation of the statute, were, in fact, wholesome or nutritious articles of food. It is entirely consistent with that offer that many, indeed, that most kinds, of oleomargarine butter in the market contain ingredients that are or may be-
731 come injurious to health. The court cannot say, from anything of which it may take judicial cognizance, that such is not the fact. Under the circumstances disclosed in the record, and in obedience to settled rules of constitutional construction, it must be assumed that such is the fact.

* * * * * * *

And as it does not appear upon the face of the statute, or from any facts of which the court must take judicial cognizance, that it infringes rights secured by the fundamental law, the legislative determination of those questions is conclusive upon the courts."

In the light of this decision can it be doubted that, if proof had been offered in the court below, as it was in the case at bar, that oleomargarine was generally wholesome, such an offer could not have been properly refused? This evidence would have compelled the court to take judicial cognizance of facts directly contradicting the presumed determination of the legislature that oleomargarine was, in the main, unwholesome. The only rational reason for the existence of the statute would then have failed, and the legislation must, in consequence, have been held invalid, as infringing the constitutional rights of liberty and property, defined by Mr. Justice Harlan in his opinion to be the "enjoyment upon terms of equality with all others in similar circumstances of the privilege of pursuing an ordinary calling or trade, and of acquiring, holding and selling property."

In the case of State *v.* Addington, 77 Mo., 110, to which the State refers with so much confidence, the validity of a statute practically

identical with that in the Powell case was before the court. It appears from the statement of facts on page 111 that the only evidence offered as to the character of the prohibited article was that the specific substance sold by the defendant to the prosecuting witness was a wholesome article of food.

732 "On the trial it was agreed that defendant sold to the prosecuting witness in the city of St. Louis, on the 1st day of November, 1881, one original package of an oleaginous substance or compound, other than that produced from unadulterated milk or cream from the same, bearing a general resemblance to butter and sold as an article of food.

* * * * * * *

The defendant offered the testimony of a chemical expert to the effect that he had made a comparative analysis of the article sold with pure dairy butter; that the product sold is, in all respects, as healthful and nutritious as pure butter and is not more liable to adulteration or deception."

This offer the court held irrelevant, and, in passing upon the question, Justice Sherwood says (pp. 116, 117):

"Relative to the offer of defendant to prove that the article he sold was wholesome as an article of food, the testimony, as adjudged by the trial court, was wholly irrelevant. The position of the defendant in substance *if* that if the wholesomeness of the article as one of food could be established that thereby the constitutionality of the act which forbids its sale would be overthrown. This is clearly a *non sequiter*. Such a position, if pushed to its logical conclusion, would utterly overthrow the exercise of the police power by the State; overthrow every law the wisdom of which could not bear the test of scrutiny. Proceeding on such theory a man arrested for killing game at an unlawful season might appropriately offer to prove that the birds killed were injurious to the public or were destructive to crops. Or, made to submit to sanitary regulations, might claim that there was no disease on board his ship and, therefore, the law which compelled him to remain at quarantine was an arbitrary infringement of his constitutional rights.

* * * * * * * *

The central idea of the statute before us seems very manifest; it was, in our opinion, the prevention of facilities for selling or manufacturing a spurious article of butter, resembling the genuine article so closely in its external appearance as to render it easy to

733 deceive purchasers into buying that which they would not buy but for the deception."

Thus, we say that, had the evidence offered in the Addington case tended, as it did in the Marx case, to bring to the knowledge of the court the fact that oleomargarine, in all cases, was perfectly wholesome, so as to rest the question of whether the legislature has the power to protect and foster one industry by absolutely prohibiting the carrying on of another, it is not possible that the Missouri

statute would have been sustained. And this, even though, as the court said, the decision turned upon the question of fraud. We, therefore, submit that the Addington case cannot, by any possible construction, be authority in the case at bar.

Having discussed the tests, as to the purpose for which a statute is enacted, we now come to the application of that discussion to the statute in question.

IV.

Does the Missouri statute exist solely for the purpose of protecting and fostering the cream of tartar baking powder industry, by prohibiting absolutely the manufacture or sale of baking powder made with alum, or is its clear purpose and effect the prevention of fraud upon the people of Missouri, or the protection of the public health?

To answer this question we must first look at the statute itself.

Does it prohibit the manufacture or sale of alum baking powder made in "imitation" of cream of tartar baking powder, or put up in such a manner as to deceive the public as to its true character?

734 Does it require all packages containing alum to be so labeled?

Or, does it absolutely prohibit the manufacture or sale of all baking powder which contains alum, even though such baking powder be labeled so as to notify the public of its true character?

Clearly the latter. For it provides that it shall be unlawful for any person to manufacture or sell any article, compound or preparation, for the purpose of being used, or which is intended to be used, in the preparation of food, in which article there is any alum.

By the evidence it is conclusively established that baking powder made with alum is, in general, perfectly wholesome.

We, then, have a statute absolutely prohibiting the manufacture or sale of an article not made in "imitation" of any superior article in no case injurious to the public health, an article well known to commerce, an article used by the people for the last twenty-five years without any deleterious effects whatsoever, an article which we venture to say enters into the food composition of the great majority of the citizens of the State of Missouri.

Upon the tests recognized by the highest courts in the land, and nowhere contradicted, such a statute must be regarded as having been enacted solely for the purpose of protecting and fostering the cream of tartar baking powder industry, by the absolute annihilation of a competitor, with which the said cream of tartar baking powder manufacturers could not successfully compete in the open market.

The statute cannot be defended on the ground that it was necessary for the protection of the public health; for, as we have already indicated, that question, by the testimony in this case, and by the common knowledge of everybody, cannot be contended.

735 The argument of the State that the legislature has determined that baking powder containing alum is, in general,

injurious to the public health, and that the court cannot go back of that determination, has no force, for in the language of Tiedeman in his work on "Limitations of Police Power" (page 297):

"There can be no doubt that the scientific correctness of the judgment of the legislative body in such a case is a judicial question and therefore subject to review by the courts, for in no other way can the legislature be kept within the limitations of the constitution. If it is only necessary for the legislature to pronounce a calling injurious to the public in order to justify its prohibition there is no limit to the police power of the Government. Constitutional restrictions would exert no greater influence than disorganized public opinion; and absolutism, monarchical, aristocratic or democratic, according to the circumstances, would be the corner-stone of such a government, at least in theory. The recognition of the rights of the minority would be only a matter of special grace and favor."

Can this statute be defended on the other ground that it was enacted for the purpose of preventing imitations and fraud upon the public? To maintain this position the State must establish that alum baking powder is an inferior article; therefore, to prevent the public from being deceived, it must be prohibited altogether. Such a position is simply monstrous. The purpose of a statute is to be found by reference to its obvious and legitimate effect. The obvious and legitimate effect of this statute does not fit its alleged purpose, but goes far beyond it. If it were the intention of the legislature to only prevent the imitation, by an inferior article, of a superior article, why did it prohibit absolutely the manufacture and sale of baking powders made with alum, even though such baking powders be labeled so that no one could be deceived as to their composition? Why did it not satisfy the legislators of the State of
736 Missouri as it did the legislators of the State of Minnesota to enact that all baking powders should be labeled so as to indicate their true character?

If the protection of the public health was the purpose of this statute, why, we submit, did the legislature couple with alum such drugs as calomel, bismuth and arsenic, which are known and recognized as vicious poisons, and which are never used in the preparation of any food? Was it because, as the learned representatives of the State have intimated, the court cannot separate alum from the others, but the statute must stand or fall as an entirety? That because the legislature has said that calomel or arsenic is unhealthful in the preparation of food it cannot be contradicted by proof absolutely conclusive, as there is in this record, that alum is healthful and wholesome as a constituent of baking powder? That this statute can be declared unconstitutional as to alum and constitutional as to arsenic, calomel, bismuth and ammonia there can be no doubt, for it is a rule of statutory construction settled beyond dispute that where a statute is susceptible of separation one part of it can be held invalid and the other part valid.

Can it, then, be seriously denied that the obvious and legitimate

effect, the only intent and purpose of this statute, was to protect and foster the cream of tartar baking powder industry, by driving from the field the successful rival, baking powder containing alum?

As has been said in Mugler *v.* Kansas, 123 U. S., 661:

"The courts are not bound by mere forms, nor are they to be misled by mere pretenses. They are at liberty—indeed, are under a solemn duty—to look at the substance of things, whenever they enter upon the inquiry whether the legislature has transcended the limits of its authority. If, therefore, a statute purporting to have been enacted to protect the public health, the public morals,
737 or the public safety, has no real or substantial relation to those objects, or is a palpable invasion of rights secured by the fundamental law, it is the duty of the courts to so adjudge, and thereby give effect to the constitution."

If this statute can be sustained, to what end will the philanthropic legislators of the State of Missouri go in protecting its unfortunate citizens? Could they not as well enact that no one should use rye flour in the manufacture of bread, or wool in the making of clothing? Could they not decree that no one should eat pork, because, forsooth, it might disagree with his digestion? Could they not, with equal consistency, establish a protective measure affecting every branch of trade and every industry? Thus might a most hideous and undemocratic system of protection and discrimination be introduced, depriving men of their constitutional rights to enjoy, on terms of equality with their fellow-men, the privilege of pursuing an ordinary calling or trade, or of acquiring, holding, accumulating and selling property.

This statute not only attempts to deprive the citizens of Missouri from pursuing a legitimate and well-established trade, but it deprives them of selling the property which by industry and economy they have accumulated. For it makes no discrimination between baking powder owned and in the State of Missouri when the law took *effect*, and that which might afterwards be manufactured or imported into said State, but it is operative as against both, and is, therefore, a confiscation of all the baking powder containing alum in the State of Missouri at the time said law went into effect.

If this sort of legislation were to be permitted we might expect to behold the interesting but dishonorable spectacle of competing industries struggling to get control of the legislature in order
738 to effect the suppression and ruin of all rivals with which they found themselves incapable of competing, in a fair, free and open market.

But we shall not behold that spectacle, for we confidently believe the iniquity of this law must be so apparent to the court that it will quickly receive the stamp of judicial disapproval. We believe that the court by its opinion will say that the legislature, however carefully or however inadvertently it may have acted, cannot decide in violation of the guaranties of the State and Federal Constitutions, that one branch of a great industry shall be annihilated; that those

engaged therein shall be deprived of their liberty and their property in order that another branch of the same industry may thereby be protected and fostered.

Very respectfully submitted,

SEDDON & BLAIR AND
STANLEY STONER,
Attorneys for Appellant.

Assisted by Messrs. Winston & Meagher, of Chicago, Mr. Silas H. Strawn of that firm having prepared this reply.

739 And afterwards, to wit, on the 11th day of October, 1900, the following further proceedings were had in said cause, viz:

STATE OF MO., Resp.,
v.
WHITNEY LAYTON, App.

Come now the said parties by attorneys, and after argument herein, submit this cause to the court.

And afterwards, to wit, on the 12th day of February, 1901, the further following proceedings were had in said cause, namely:

STATE OF MISSOURI, Resp.,
vs.
WHITNEY LAYTON, App.
} Appeal from St. Louis Court of Criminal Correction.

Now at this day, come again the parties aforesaid, by their respective attorneys, and the court here being now sufficiently advised of and concerning the premises, doth consider and adjudge that the judgment aforesaid, in form aforesaid, by the said St. Louis court of criminal correction rendered, be in all things affirmed, and stand in full force and effect; and that the said respondent recover against the said appellant its costs and charges herein expended, and have therefor execution. (Opinion filed.)

Which said opinion is in words and figures as follows, to wit:

In the Supreme Court of Missouri, Division No. 2, October Term, 1900.

STATE OF MISSOURI, Respondent,
vs.
WHITNEY LAYTON, Appellant.

On the 30th day of August, 1899, the assistant prosecuting attorney of the St. Louis court of criminal correction lodged in the St. Louis court of criminal correction the following information against Whitney Layton of said city:

"Richard Johnson, assistant prosecuting attorney, of the
740 St. Louis court of criminal correction, now here in court, on behalf of the State of Missouri, information makes as follows:

That Whitney Layton in the city of St. Louis, on the 28th day of August, 1899, then and there doing business in this State, did unlawfully manufacture, sell and offer to sell a certain compound and preparation, to wit: Layton's health food baking powder, which said compound and preparation was so manufactured and sold for the purpose of being used and was intended by said Layton to be used in the preparation of food in which said compound and preparation so manufactured and sold there was alum. Contrary to the form in such case made and provided, and against the peace and dignity of the State.

RICHARD M. JOHNSON,
Ass't Pros. Att'y of the St. Louis Court of Crim. Correction."

The defendant was arrested and entered his plea of not guilty.

A jury was waived and the cause tried to the court.

At the trial the State's representatives filed and read in evidence the following stipulation:

"STATE OF MISSOURI
vs.
WHITNEY LAYTON.

"For the purpose only of the trial of this cause and at said trial the defendant Whitney Layton for a stipulation covering a part of the facts in the above-entitled case, admits that in the city of St. Louis, Missouri, on the 28th day of August, 1899, he, the defendant, then and there doing business in the State of Missouri did manufacture, sell and offer to sell to J. M. Houston Grocer Company, then doing business at said city, a certain compound and preparation to wit: one case containing two dozen, one-pound cans of baking powder, known and designated as Layton's health food baking powder, which said compound and preparation, so manufactured sold and offered for sale by him for the purpose of its being used and was intended by defendant and by said J. M. Houston
741 Grocer Company to be used in the preparation of food.

Defendant further admits that in said compound and preparation so manufactured, sold and offered to be sold by him there was alum, and that the fact that the same contained alum was then well known to defendant; and it is further agreed and stipulated that at the trial of this case either party may offer any other evidence not inconsistent with the above facts which he may deem material, relevant and competent in the case, subject to objection by the other party to its materiality, relevancy or competency.

STEWART, CUNNINGHAM & ELIOT, WITH
H. A. CLOVER, JR.,
Prosecuting Attorney for Plaintiff.
SEDDON & BLAIR,
STANLEY STOVER, *Attorneys for Defendant.*"

The prosecution then rested.

The defendant then offered evidence tending to establish the following facts:

Baking powders have been in use for more than fifty years. They are intended to furnish to the people a simple, cheap, efficient and wholesome leavening agent in the cooking of food, as a substitute for yeast, which is a very slow and more expensive leavening agent, and one which requires considerable intelligence in the cook to use successfully. All baking powders furnish this leavening agent in the form of carbon dioxide (carbonic acid gas), which is given off from the baking powder in preparing and cooking food. This gas being liberated in the dough forms bubbles which take permanent form in the baked bread, thus making it light and porous. All baking powders in their essential features are the same. They all supply this leavening agent (dioxide or carbon), by freeing it from bicarbonate of soda. They differ in the non-essential manner in which this carbon dioxide is released from the bicarbonate of
742 soda. There are three classes of baking powders known to commerce, viz: the cream of tartar baking powders, the phosphate baking powders and the alum baking powders.

The cream of tartar powders are composed of bicarbonate of soda and cream of tartar (bitartarate of potassium), mixed with starch as a filler. The soda and cream of tartar are combined in such proportions that when they are united together in the presence of water, in the process of cooking, they react upon each other, and free the carbon dioxide which leavens the bread. The resulting product left in the bread after cooking is Rochelle salts, a purgative agent.

In the phosphate powders the active agent is the phosphate of calcium which unites with the bicarbonate of soda and liberates the dioxide of carbon, the leavening agent.

The alum powders, as they do not differ from the cream of tartar powders in the main essential features of a baking powder, to wit, the liberation of the carbon dioxide from bicarbonate of sodium, but merely in the non-essential mode of liberating the gas, do not differ from each other essentially. In the phosphate alum powders, phosphate of calcium is used to aid in liberating from the bicarbonate of soda the gas, the leavening agent, the essential thing.

The straight alum baking powders are composed of bicarbonate of soda and a double sulphate salt of sodium and aluminum, which technically is not alum at all but is popularly called soda alum, with starch as a filler or carrier. The alum and the bicarbonate of soda are mixed in such proportions that in the cooking process the carbon dioxide is released as a leavening agent, as in the case of the cream of tartar baking powders. The resulting products are sulphate of sodium and hydroxide (hydrate) of aluminum.

The evidence of defendant tended to show that none of the products left in the food cooked with alum baking powders are at all njurious to the human system.

743 The evidence shows that the trade in alum baking powders as a trade has given entire satisfaction to the people. Alum baking powders are nearly as standard an article as flour or sugar. They are to be found upon the shelves of every grocery store, not only in Missouri but in the United States. They were first introduced about 1870. In spite of the fiercest competition and most hostile rivalry upon the part of manufacturers of cream of tartar powders, who the evidence shows have used every effort to prejudice the mind of the public by every manner of advertisement and representations, the trade rapidly extended until it has now reached vast proportions. The evidence tended to show that alum baking powder sold in the United States last year amounted to not fewer than 120,000,000 pounds and involved an enormous expenditure in the manufacture and distribution.

The defendant's evidence also tended to show that not only was the particular case of baking powder, known as "Layton's health food" for the sale of which he was prosecuted, but also all alum baking powders in general are and always have been healthful and wholesome adjuncts in the preparation of human food. The evidence tends to show that no one had ever either heard of, or had known of a single case where the health of a single human being had been injured, or had been supposed to have been injured by the use of alum baking powder in the preparation of food, and that the trade in alum baking powders as a trade prior to the passage of this law was an honest and lawful business in a generally harmless, and useful preparation used as an adjunct in the cooking of food. The manufacturers and sellers of both such powders, cream of tartar and alum, have been engaged in competition with each other in furnishing to the people from bicarbonate of soda a leavening agent for cooking bread, cake, etc. They differ only in the non-essential manner of freeing the gas. That the trade in cream of tartar
744 powders has been practically monopolized by the Royal Baking Powder Co. which controls the cream of tartar market.

To all of this evidence counsel for the State objected when it was offered on the ground that in view of the stipulation made between the parties which was read by the State in making its case, all evidence which might be offered by the defendant in his defense would be irrelevant and immaterial.

The court at the time of the objection announced it would not then rule upon the objection but would hear the evidence subject to such objection and would at the end of the case announce its ruling and if it concluded the objection was well taken would rule out all of such evidence.

On the other hand the State in rebuttal offered much evidence by distinguished chemists, and physicians that alum in the quantities usually used in the preparation of baking powders was and is injurious to the health. That while it assists in liberating the carbonic acid, gas and thus makes the bread light, there is a residuum of alumina left in the bread which is solvable and enters into the

system and acts as an astringent and is deleterious; that there was a general prejudice in the minds of the public against alum powders: that while the sale of alum powders was very enormous, people generally were not advised that they were purchasing alum powders.

After all the evidence was in, the court sustained the objection of the State and excluded all defendant's evidence as irrelevant and immaterial to the issue in the case. To which the defendant duly excepted at the time.

Every item of evidence offered by defendant was avowedly introduced for the purpose of showing that the statute under which defendant was prosecuted was unconstitutional and void, which contention the court overruled and found defendant guilty. The statute which defendant is charged to have violated is the act of
745 May 11th, 1899, and is as follows:

"An act to prevent the use of unhealthy chemical- or substances in the preparation or manufacture of any article used or to be used in the preparation of food."

Be it enacted by the General Assembly of the State of Missouri, as follows:

SECTION 1. That it shall be unlawful for any person or corporation doing business in this State, to manufacture, sell or offer to sell, any article, compound or preparation, for the purpose of being used, or which is intended to be used, in the preparation of food, in which article, compound or preparation, there is any arsenic, calomel, bismuth, ammonia or alum.

SECTION 2. Any person or corporation violating the provisions of this act shall be deemed guilty of a misdemeanor and shall upon conviction, be fined not less than one hundred dollars, which shall be paid into and become a part of the road fund of the county in which such fine is collected.

"Approved May 11th, 1899. Takes effect August 22d, 1899."

The defendant asked various declarations of law to the effect that the legislature could not arbitrarily declare his business unlawful, which were refused and he saved his exceptions and in due time filed his motions for new trial and in arrest, which were likewise overruled.

As already indicated in the statement of the case the one great question upon this record is the constitutionality of the act of May 11th, 1899, making it a misdemeanor in this State "for any person or corporation doing business in this State to manufacture, sell, or offer to sell any article, compound or preparation *or preparation* for the purpose of being used or which is intended to be used, in the preparation of food, in which article, compound or preparation there is any * * * * alum."

The act was obviously aimed at what is known as "alum
746 baking powders." While the act also condemns the use of arsenic, calomel, bismuth and ammonia in baking powders

there is not the slightest evidence that either of these poisons or substances is ever used in the preparation of baking powders in the ordinary trade by reputable dealers and merchants whereas the evidence which the court heard but finally excluded in making up its verdict and judgment disclosed that alum is and has been for more than a quarter of a century an ingredient in the preparation of baking powders; that baking powders containing alum in some degree are used to an enormous extent; that not less than 120,000,000 pounds of such powders have been sold in the United States in the year next preceding the filing of the information in this case.

The defendant is a manufacturer of a baking powder known as "Layton's health food baking powder," and after the act of May 11th, 1899, if valid, went into effect, sold a case of said baking powder in the city of St. Louis.

The constitutionality of the act is assailed on two grounds.

First. That it violates section 28 of article 4 of the constitution of Missouri;

Second. That it conflicts with sections 4 and 30 of article 2 of the constitution of Missouri.

It is a trite *d*aying that when the courts are called upon to decide that an act of the legislature violates the organic law they start with every presumption in favor of the validity of the statute. This much we owe to a co-ordinate branch of the Government; upon which the people in the Constitution have conferred the law-making power.

The right and power of the courts under our peculiar form of government to declare a solemn and formal act of the legislature invalid arises not out of any supposed or assumed superiority of the judicial department over that of the legislative branch of the Government, but is founded upon the fact that the Constitution is the organic law which defines the limitations of all branches of the Government and is the supreme law by which the acts of all branches of the Government must be tested and in the very nature of things the judiciary must in performing its functions determine whether the legislative enactment is in harmony with the supreme law.

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Proceeding a step farther it must be conceded that the validity of the act in question must be referable to what we denominate the police power of the State, and that the legislature is clearly the department of the Government which is authorized to exercise the police power.

Under forms of government where limitations upon executive and legislative powers do not exist, there is no restriction upon this necessary function of government, but under our Federal and State governments limitations are to be found in our written constitutions.

Said the Supreme Court of the United States in Mugler *vs.* Kansas 123 U. S. loc. cit. 661: "It does not follow that every statute enacted ostensibly for the promotion of these ends is to be accepted as a legitimate exertion of the police powers of the State. There are of

necessity limits beyond which legislation cannot rightfully go. While every possible presumption is to be indulged in favor of the validity of a statute, Sinking Fund cases, 99 U. S. 700 971–'8, the courts must obey the constitution rather than the law-making department of government and must upon their own responsibility determine whether in any particular case these limits have been passed." "To what purpose," it was said in Marbury *v.* Madison, 1 Cranch 137–176, "are powers limited and to what purpose is that limitation committed to writing if these limits may at any time be passed by those intended to be restrained? The distinction between a government with limited and unlimited powers is abolished if those limits do not confine the persons on whom they are imposed and if acts prohibited and acts allowed are of equal obligation."

"The courts are not bound by mere forms, nor are they to be led by mere pretences. They are at liberty—indeed, are under
748 a solemn duty—to look at the substance of things, whenever they enter upon the inquiry whether the legislature has transcended the limits of its authority. If therefore, a statute purporting to have been enacted to protect the public health, the public morals, or the public safety, has no real or substantial relation to those objects or is a palpable invasion of the rights secured by the fundamental law; it is the duty of the courts to so adjudge and thereby give effect to the constitution."

Accepting this statement of the rights and duties of the respective departments, we are brought to the contention of the parties to this record.

The defendant insists that the compound prepared by himself and other manufacturers as and for a baking powder is a perfectly healthful article, that has been in general, indeed universal use in this State and throughout the United States for thirty years. That these so-called alum baking powders have proven acceptable as a common household article, as a most useful adjunct to the cooking process; that during all that time not a single instance had occurred in which a single person had been rendered sick or suffered in health from their use; that they had become so acceptable to the bakers and housewives of the land that their production and sale amounted to 120,000,000 pounds in a single year; that no more objection could be urged against their use as being deleterious than can be and has been urged by vegetarians against the use of meat, or by certain persons against the common table salt or the use of wheat bread, and that it is no more liable to adulteration than flour or sugar.

He urges that to strike down this great industry in view of its recognized harmlessness is an arbitrary and unwarranted attempt to exercise the police power of the legislature.

On the other hand the State insists that section 4 of our bill of rights which provides "that all constitutional government is intended to promote the general welfare of the people; that all persons have a natural right to life, liberty and the enjoyment of the
749 gains of their own industry; that to give security to these things is the principal office of government, and that when

government does not confer this security it fails of its chief design," and section 30 of the bill of rights which ordains "that no person shall be deprived of life, liberty or property, without due process of law," are not infringed by this act. That "the Constitution does not guarantee or give to any person the right to manufacture or sell any chemical or substance which the legislature has declared to be unhealthy and has forbidden."

The State's counsel further insist that the judgment of the criminal court is in conformity with the decision of this court in State *v.* Addington, 77 Mo. 110, which case they insist involved every essential feature of the case at bar.

In State *v.* Addington, *supra*, the defendant was prosecuted under the statute of this State of March 24, 1881, entitled "An act to prevent the manufacture and sale of oleaginous substances or compounds of the same in imitation of the pure dairy products."

In sustaining that statute, this court stated concisely the ground upon which it rests, as follows:

"The central idea of the statute before us seems very manifest; it was, in our opinion, the prevention of facilities for selling or manufacturing a spurious article of butter, resembling the gen*tle* article so closely in its external appearance as to render it easy to deceive purchasers into buying that which they would not buy for the deception. The history of legislation on this subject as well as the phraseology of the act itself very strongly tend to confirm this view. If this was the purpose of that enactment we discover nothing in its provisions which enables us to say that the legislature exceeded the power confided to that department of the Government and unless we can say this we cannot hold the act as being anything less than valid."

Commenting upon this decision Tiedemann in his work on
750 "Limitations of Police Power," page 296, says, "But the only valid objection to its sale is its close resemblance to genuine butter and the consequent opportunity for the perpetration of fraud. And this was the sole ground upon which the constitutionality of the law was sustained by the supreme court of Missouri."

In State *v.* Bockstruck, 136 Mo. 356, State *v.* Addington, *supra*, was reviewed by the same judge who wrote it as confirming the view taken of that case by Tiedeman, we quote: "We consider that the State has the same right to forbid and punish the manufacture of counterfeit butter that it has to forbid and punish the manufacture of counterfeit coin."

"The like view was taken by us of the validity of the act of 1881, in relation to the manufacture or sale of imitation butter (State *v.* Addington, 77 Mo. 110) though the latter act contained no such provisions as are contained in section 8 of the present act."

It will be observed that the court dwells in both cases upon the fact that in both acts "the evident object and dominating idea was to prevent the manufacture or sale of a spurious article of butter,"

and upon this ground we still have no hesitancy in holding that such legislation is clearly valid.

Such, also, is the ruling in People *v.* Arensburg, 105 N. Y. 123, in which the act was entitled "An act to prevent deception in the sale of dairy products," and it was forbidden to sell any article "in imitation or semblance or designed to take the place of natural butter."

In State *v.* Marx, 99 N. Y. 377, the court of appeals held an act of the legislature invalid which made the manufacture out of any oleaginous substance or compound other than that produced from unadulterated milk and cream, any article designed to take the place of butter &c. Judge Rapallo in the course of the opinion after stating that the evidence disclosed that oleomargarine was a perfectly healthful and pure article of food, says, "One of the
751 learned judges who delivered opinions at the general term endeavored to sustain the act on the ground that it was intended to prohibit the sale of any artificial compound as genuine butter or cheese made from unadulterated milk or cream. That it was the design to deceive which the law rendered criminal."

"If that were a correct interpretation of the act we should concur with the learned judge in his conclusion as to its validity, but we could not concur in his further view that such an offense was charged in the indictment, or proved on the trial."

"The prohibition is not of the manufacture or sale of an article designed as an imitation of dairy butter or cheese or intended to be passed off as such but of an article designed to take the place of dairy butter or cheese." "Simulation of butter is not the act prohibited."

Again the court says, "It appears to us quite clear that the object and effect of the enactment were not to supplement existing provisions against fraud and deception by means of imitations of dairy butter but to take a further and bolder step and by absolutely prohibiting the manufacture or sale of any article which could be used as a substitute for it, however openly and fairly the character of the substitute might be avowed and published, to drive the substituted article from the market and protect those engaged in the manufacture of dairy products against the competition of cheaper substances capable of being applied to the same uses as articles of food." The court then asks the question, "Who will have the temerity to say that these constitutional principles are not violated by an enactment which absolutely prohibits an important branch of industry for the sole reason that it competes with another and may reduce the price of an article of food for the human race." The court held that statute unconstitutional.

Judge Dillon in his admirable work on Municipal Corporations (4 ed.) sect. 141 p. 211, in a note to the text says "We cannot refrain from expressing our full concurrence in the views and
752 conclusions of the court of appeals of New York in People *v.* Mark. * * *

The Pennsylvania act of 1885, under which Powell was convicted (Powell *v.* Com., 114 Pa. St. 265 and affirmed in 127 U. S. 678) makes the manufacture and sale of oleomargarine though open and unconcealed, a crime. We cannot but express our regret that the constitution of any of the States or that of the United States admits of a construction that it is competent for a State legislature to suppress (instead of regulating) under fine and imprisonment, the business of manufacturing and selling a harmless and even wholesome article if the legislature chooses to affirm, contrary to the fact, that the public health or public policy requires such suppression. The record of the conviction of Powell for selling without any deception a healthful and nutritious article of food makes one's blood tingle." At first blush the decisions in the Marx and Addington cases may appear to collide but upon a closer view it will be seen that the court of appeals distinctly assents to the doctrine upon which Judge Sherwood announces the Addington case rests, for speaking of the effort to sustain the New York statute on the ground "that it was intended to prohibit the sale of any artificial compound as genuine butter or cheese made from unadulterated milk or cream; that it was that design to deceive which the law rendered criminal." Judge Rapallo says, "If that were a correct interpretation of the act, we should concur as to its validity."

As the oleomargarine act considered in the Addington case prohibited imitation butter, and as this court held it was valid because it shut the door against the designs to perpetrate fraud the great underlying principle of both cases was the same though the two courts might differ as to the meaning of the words of the two acts.

Does the act of May 11th, making it penal to use alum in the preparation of baking powders, bring it within the reason of State *vs.* Addington, In the Addington case there was a recognized standard for the article which the legislature intended to protect
753 against fraudulent imitation, to wit, natural butter made from pure dairy products or unadulterated milk, and in accordance with our decision in that case we hold that statutes enacted to prevent the imposition of a deception upon others are clearly valid. Cook *vs.* The State, 110 Ala. 40; Stotts *vs.* Thompson, 44 Minn. 271; State *vs.* Marshall, 64 N. H. 549; State *vs.* Newton, 50 N. J. L. 534; Com. *vs.* Huntley, 156 Mass. 236; State *vs.* Hogan, 55 Minn. 183.

But the question raised on this record, while a kindred one, is we conceive, different. It seems to us that in the nature of things there is a wide difference between legislation prohibiting or regulating the manufacture and sale of an article which is manufactured with a design to imitate a standard or superior article, and pass it off on the public, which cannot readily detect the imposition, for something different from what it is, and the manufacture and sale of an article which in truth and fact is admitted to be innocuous and healthful, and in general use, and about which there is neither secrecy or imitation of another article of conceded purity and wholesomeness.

The Addington and similar cases settle the constitutionality of the

former but do not reach the latter. As the case at bar does not fall within the reasoning and purview of the Addington case, that case does not reach the difficulty here. The statute upon which this prosecution is based is not based upon the idea of imitation of one article by another.

No baking powder is recognized as the standard as is butter from unadulterated milk in the oleomargarine statute. Here the statute must be upheld, if at all, upon the right of the legislature to make all needful laws to preserve the public health.

The right of the State to protect the health, morals and safety of its people by regu*al*tions that do not interfere with the execution of the powers of the General Government or violate rights secured by the Constitution of the United States is now recognized by all courts in this country.

754 It is peculiarly a legislative function. While it is true that there are limits under our system to this power, we must start with the presumption in favor of the act. While we do not accede to the proposition that the legislature can arbitrarily declare any article of food in general use, and concededly wholesome and innocuous, to be unhealthy, and its production and sale, a crime, and would have no hesitancy in declaring such an act void, when the act on its face disclosed its arbitrary and unreasonable character; or where, as in the Marx case, 99 N. Y. 377, when such an act is challenged on such ground, it is admitted by the State that the prohibited article is innocuous and beneficial in itself, and is not made in imitation of, or with a view to deceive the public, but is made and vended without secrecy and without imitation of any other, and the only purpose of the law is to prevent competition, still we find ourselves confronted in this case with a state of facts essentially different from that presented to the court in the Marx case.

While defendant offered much evidence to show that alum baking powders were a useful and harmless preparation there is no gainsaying the fact that the State offered much pertinent testimony to the contrary. That there has long existed a strong prejudice against the use of alum in the making of bread must be conceded. Whether the prejudice is well founded is another matter.

As early as the 37th year of the reign of George the Third, the British Parliament absolutely prohibited the use of alum in the making of bread. Stat. 37 Geo. 3, ch. 98, sec. 21, and irrespective of the statute it was held indictable to use it in large quantities. Rex *v.* Dixon, 4 Camp. 12. Such seems still to be the statute law of England. Bread Act, 1836; 1 Chitty's Eng. Stats. title, "Bread" & "Adulteration of Food."

Several States of our Union, while not going to the extreme of our General Assembly, have statutes passed with a view to the protection of the public against these alum powders by requiring

755 that the cans in which they are sold shall give notice that they contain alum, and these acts have been sustained as fairly within the police power of the State. This court in view of

this sharp conflict of testimony as to the noxious of innoc-ous character of alum baking powders, cannot take judicial notice that these powders are a perfectly innocuous preparation.

Under these circumstances, then, are we told to hold that the court of criminal correction erred in not passing upon the question of fact tendered to him and having found the fact, in not deciding the law, constitutional or unconstitutional accordingly as it appeared to him to be harmful and deleterious, or harmless and innoxious? "If so," as was said in People *vs.* Cipperly, 101 N. Y. 634, affirming 37 Hun. 324 by the court of appeals of New York, the same court which decided the People *vs.* Marx, 99 N. Y. 377, "the court must charge the jury in each case, that if they find milk below that standard, is unwholesome, then the statute is constitutional; if they find it to be wholesome then the statute is unconstitutional."

"Evidently a constitutional question cannot be settled, or rather unsettled in that way. The constitutionality would vary with the varying judgments of juries." Substitute alum baking powders for milk, and we have the rule applicable to this case. Long before the decision of the court of appeals in that case, however, Judge Leonard of this court in State *vs.* Rich, 20 Mo. 396, had said, "If whenever any act done under the authority of the law came in question collaterally, the constitutionality of the law could be contested, then the trial of the main issue must necessarily be delayed until the preliminary fact upon which the validity of the contested legislative act depended, should be first tried and determined upon testimony which being different in different cases might involve the absurdity of deciding the *car* constitutional one day and unconstitutional the next." And he held the evidence inadmissible."

756 What, then, is the test when the constitutionality of an act of the legislature is assailed as invading the right of the citizen to use his faculties in the production of an article for sale for food or drink? We answer that if *it* be an article so universally conceded to be wholesome and innoxious, that the court may take judicial notice of it the legislature under the constitution has no right to absolutely prohibit it, but if there is a dispute as to the fact of its wholesomeness for food or drink, then the legislature can either regulate or prohibit it. The constitutionality of the law is not to be determined upon the question of fact in each case, but the courts determine for themselves upon the fundamental principles of our constitution which vests the legislative power in the General Assembly, and the rule of construction adopted by our courts "that an act of the legislature is not to be declared void, unless the violation of the constitution is so manifest as to leave no room for reasonable doubt." Com. *v.* Smith, 4 Bin. (Penn.) 117; Cooley Const. Lim. 6 ed. 216; State *vs.* Nelson, 39 N. E. Rep. 22.

The cases abound, in the greatest courts, State and Federal, in which this limitation has been set upon their own authority by the greatest judges who have illumined our jurisprudence. Ogden *v.* Saunders, 12 Wheat. 213; Sinking Fund cases, 99 U. S. 700; *In re* Wellington *et al.*, 16 Pick. 87; Perry *vs.* Keene, 56 N. H. 514.

In this last case Ladd, J. said: "Certainly it is not for this court to shrink from the discharge of a constitutional duty; but at the same time, it is not for this branch of the Government to set an example of encroachment upon the province of the others. It is only the enunciation of a rule that is now elementary in the American States to say that before we can declare this law unconstitutional we must be fully satisfied—satisfied beyond a reasonable doubt—that the purpose for which the tax is authorized is private and not public."

Keeping in view this cardinal principle for our guidance,
757 how can we say in view of the contradictory evidence as to the effect on the health of bread made with alum baking powders, that the legislature beyond a reasonable doubt transcended its constitutional right in prohibiting the use of alum in bread? We are not authorized to do so.

It may be argued with great force that a statute similar to the Minnesota statute would be sufficient for the protection of purchasers who have a prejudice against these powders; it may be that in the small quantities now used in these alum powders generally it cannot be shown that any particular person has ever lost his health from their use, but that the legislature deemed their use deleterious cannot be denied and there is no such conclusive evidence to the contrary as to justify this court in holding this act, intended for the benefit of the public health, is void. The mere wisdom or unwisdom of the act, is not for us to decide.

The judgment must be and is affirmed.

Sherwood, P. J. and Burgess, J. J. concur.

JAS. B. GANTT, *J.*

758 And afterwards, to wit, on the 19th day of February, 1901, the further following proceedings were had in said cause, viz:

STATE OF MO., Resp., }
v. }
WHITNEY LAYTON, App. }

Comes now the said appellant by attorney, and files his motion to transfer this cause to the court in banc.

Which said motion to transfer to court in banc is in words and figures as follows, to wit:

In the Supreme Court of Missouri, Division No. 2, October Term, 1900.

STATE OF MISSOURI, Respondent, *vs.* WHITNEY LAYTON, Appellant. } No. 10223. Appeal from St. Louis Court of Criminal Correction.

Motion of Appellant Layton.

Now comes Whitney Layton, the appellant in the above-entitled cause, and the losing party under the decision of this division of this court, rendered on the 12th day of February, A. D. 1901, and moves this honorable division of the supreme court that this cause be transferred to the court in banc, there to be re-argued and heard for the reason that the cause involved a Federal question in this, that the question plainly arises under the facts contained and set forth in the record whether the law of the State of Missouri, entitled "An act to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article used, or to be used, in the preparation of food" approved May 11, 1899, under which law the said Whitney Layton was convicted in the lower trial court, is or is not void in this: that it violates and conflicts with the fourteenth amendment of the Constitution of the United States which among other things provides that,

First. No State shall make or enforce any law which shall abridge the privileges or imm-ities of citizens of the United States.

759 Second. Nor shall any State deprive any person of life, liberty or property without due process of law.

Third. Nor deny to any person within its jurisdiction the equal protection of the laws, and in that it violates and conflicts with each of the above paragraphs and provisions of said fourteenth amendment.

SEDDON & BLAIR,
STANLEY STONER,
WINSTON & MEAGHER,
Attorneys for the Appellant, Whitney Layton.

St. Louis, Mo., February 16th, 1901.

In the Supreme Court of Missouri, Division No. 2, October Term, 1901.

STATE OF MISSOURI, Respondent, *vs.* WHITNEY LAYTON, Appellant, } No. 10223.

To the State of Missouri or its attorneys of record:

Please take notice that I, Whitney Layton, will on Tuesday the nineteenth day of February, A. D. 1901, file in the supreme court

of Missouri, division No. 2, a motion to transfer the above-entitled cause to the court in banc, a copy of which said motion is hereto attached as a part hereof.

WHITNEY LAYTON,
By SEDDON & BLAIR,
WINSTON & MEAGHER,
STANLEY STONER,
His Attorneys.

We acknowledge service of a copy of the above notice this 16th day of February, A. D. 1901, and waive all objections as to time.

HENRY A. CLOVER, JR., *Pros. Att'y.* &
STEWART, CUNNINGHAM & ELLIOT, WITH
THE ATTORNEY GENERAL,
760 *Attorneys of the State of Missouri.*

STATE OF MISSOURI, }
City of St. Louis. }

James A. Seddon being duly sworn says that he did mail a copy of the attached notice and motion to Hon. Edward C. Crow, attorney general, in an envelope addressed "Hon. Edward C. Crow, attorney general, Jefferson City, Missouri," which envelope was properly stamped and was deposited in the post-office at St. Louis, Missouri, in the afternoon of Saturday the 16th of February, A. D. 1901.

JAMES A. SEDDON.

Subscribed and sworn to before me on this 16th day of February 1901. My commission as notary public will expire on the 23d day of February, 1902.

FIDILIE C. SHARP,
Notary Public, City of St. Louis, State of Missouri.

And afterwards, to wit, on the 26th day of February, 1901, the further following proceedings were had in said cause, viz:

STATE OF MISSOURI, Respondent, }
vs.
WHITNEY LAYTON, Appellant. }

Now at this day, the court having fully considered and understood the motion heretofore filed by said appellant to transfer this cause to the court in banc, doth order that said motion be and the same is hereby denied.

And afterwards, to wit, on the 27th day of February, 1901, the further following proceedings were had in said cause, viz:

STATE OF MISSOURI, Respondent,
vs.
WHITNEY LAYTON, Appellant.

Now at this day, there is presented to the Honorable T. A.
761 Sherwood, presiding judge of division No. 2, of the supreme court of the State of Missouri in chambers, a petition for a writ of error, a writ of error to the Supreme Court of the United States, a citation directed to said respondent, citing and admonishing it to appear at a Supreme Court of the United States on the 27th day of March, 1901, an assignment of errors and a bond in the sum of six thousand dollars; which said writ of error is allowed, said citation signed, said assignment of errors filed and said bond approved, to operate as a supersedeas, ordered filed and made a part of the record herein.

Which said petition for writ of error is in words and figures as follows, viz:

In the Supreme Court of the United States of America, October Term, 1901.

WHITNEY LAYTON, Plaintiff in Error,
vs.
THE PEOPLE OF THE STATE OF MISSOURI, Defendant in Error.

To the honorable the presiding justice of division number two of the supreme court of the State of Missouri:

Your petition-, Whitney Layton, respectfully shows that on the 12th day of February, A. D. 1901, the supreme court of the State of Missouri rendered a certain judgment of affirmance, thereby affirming a judgment of the St. Louis court of criminal correction, rendered on the 31st day of March, 1900, in a certain cause therein pending, wherein The State of Missouri was plaintiff and the petitioner, Whitney Layton, was defendant. That in and by said judgment the said petitioner was found guilty, in the manner and form charged in a certain information filed in said cause, and the penalty assessed against him by the said court was the sum of one hundred dollars ($100) and costs, as will appear by reference to the records and proceedings in said cause.

762 Your petitioner further shows that the supreme court of the State of Missouri is the highest court of said State in which a decision in said cause could be had.

And your petitioner claims the right to remove said judgment to the Supreme Court of the United States by a writ of error, under the statutes of the United States authorizing writs of error to State courts, because your petitioner states and shows unto the court as follows:

The act of the legislature of the State of Missouri under which the petitioner was convicted, entitled "An act to prevent the use of

unhealthy chemicals or substances in the preparation or manufacture of an article used or to be used in the preparation of food," is void, in that it violates and conflicts with the fourteenth amendment to the Constitution of the United States, because

(*a.*) Said act abridges the privileges and immunities of the said petitioner and of the citizens of the United States.

(*b.*) It deprives the petitioner of his liberty and his property, without due process of law, and

(*c.*) It denies to the petitioner the equal protection of the law,

all of which will more fully and at large appear by the record of the proceedings in said cause, which is herewith submitted.

Wherefore, your petitioner prays the allowance of a writ of error, returnable into the Supreme Court of the United States, and for citation and supersedeas; and this he will ever pray, etc.

WHITNEY LAYTON, *Petitioner*,
By SEDDON & BLAIR,
Attorneys for Petitioner.

STATE OF MISSOURI, }
City of St. Louis. }

Whitney Layton being by me duly sworn on his oath says
763 that the above and foregoing application is not made for vexation or delay but because the affiant believes in sincerety and truth that he is aggrieved by the judgment of this court in the aforesaid case of State of Missouri respondent *vs.* Whitney Layton, appellant, in which he has prayed the said writ of error.

WHITNEY LAYTON.

Subscribed and sworn to before me this 26th day of Feb'y, A. D. 1901. My term of office as a notary public expires on the 25th day of Oct. 1903.

STANLEY STONER,
[SEAL.] *Notary Public.*

I certify that in my opinion as one of the attorneys for Whitney Layton that the above application for a writ of error is well founded in law.

JAMES A. SEDDON,
Of Counsel for Whitney Layton.

And which said assignment of errors is in words and figures as follows, viz:

Assignment of Errors.

In the Supreme Court of the United States, October Term, 1901.

WHITNEY LAYTON, Plaintiff in Error,
vs.
STATE OF MISSOURI, Defendant in Error.

Comes now Whitney Layton plaintiff in error by his counsel and respectfully represents that he feels himself to be aggrieved by the proceedings and judgment of the supreme court of the State of Missouri in the above-entitled cause and assigns error thereto as follows:

First. That the said supreme court of Missouri erred in ruling and holding that the law of the State of Missouri, approved by the governor thereof on May 11th, 1899, entitled "An act to
764 prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article used or to be used in the preparation of food is a valid and constitutional law over the express objection of the defendant Whitney Layton made in the St. Louis court of criminal correction the trial court, and the said supreme court of Missouri, that said law is unconstitutional and void in this that it conflicts with that provision of srt-cle fourteen of the amendment (known as the fourteenth amendment) to the Constitution of the United States which provides that no State shall deprive any person of life, liberty or property without due process of law.

Second. That the said supreme court of Missouri erred in this, that it ruled and held that said law of the State of Missouri, approved May 11th, 1899, is constitutional and valid over the objection of Whitney Layton made in both said courts that the said law is unconstitutional and void because it conflicts with that provision of the fourteenth amendment of the Constitution of the United States which provides that no State shall deny to any person within its jurisdiction the equal protection of the law.

Third. That the said supreme court of Missouri erred in this that under the judgment of the St. Louis court of criminal correction the trial court in this case and under the said judgment of the supreme court of Missouri the said Whitney Layton, a citizen of Missouri and of the United States is deprived of his liberty without due process of law in violation of the express provision of article fourteen of the amendment (known as the fourteenth amendment) to the Constitution of the United States which provides that no State shall deprive any person of life, liberty or property without due process of law, the benefit of which provision the said Whitney Layton set up in both of said courts.

Fourth. The said supreme court of Missouri erred in said judgment in this that under the judgment of the said trial court and *the said trial court and* the said supreme court of Mis-
765 souri, said Whitney Layton a citizen of the State of Missouri and of the United States is deprived of the right guaranteed

to him by that provision of article fourteen of the amendments, (known as the fourteenth amendment) to the Constitution of the United States; that he shall not be denied by the State of Missouri within its jurisdiction the equal protection of the laws, the benefit of which right was expressly set up by said Whitney Layton in both said courts.

Fifth. Because the said supreme court of Missouri erred in not holding and ruling that the said trial court erred in refusing to give legal and proper instructions by which said ruling the said lower court directly held that the law of the State of Missouri did not conflict with each and both of said provisions of the said fourteenth amendment to the Constitution of the United States the benefit of which was expressly set up as a defense by the said Whitney Layton in both of said courts.

Sixth. Because the said supreme court of Missouri erred in not holding that the said trial court erred in overruling the fifth paragraph of the motion for a new trial of the said Whitney Layton in the said lower court, which paragraph is in the following words:

"Because the court erred in its rulings that it would hear no testimony on the part of the defendant offered by him for the purpose of showing that the law under which he was prosecuted and on which the information in this case was based was unconstitutional and erred in holding that all of said evidence offered by him for that purpose was immaterial and incompetent."

Seventh. Because the supreme court of Missouri refused to rule and hold that the said lower court had wrongfully overruled paragraph nine of the motion for a new trial of the said Whitney Layton in the said lower court, which paragraph was as follows:

"Because the court under the evidence in the case in not declaring the statute of Missouri entitled 'An act to prevent the use of unhealthy chemicals or substances in the preparation or manufacture of any article used or to be used in the preparation of food,
766 approved May 11th, 1899, purporting to prohibit any person or corporation doing business in this State to manufacture sell or offer to sell any article, compound or preparation for the purpose of being used, or which is intended to be used in the preparation of food in which article, compound or preparation there is alum' is void in so far that it prohibits the defendant from manufacturing, selling or offering to sell the article described in the information in this case and the court erred in declaring the said law to be valid and binding on the defendant in that respect."

by which said ruling the said lower court expressly held that said law of the State of Missouri did not conflict with either of the said provisions of the said fourteenth amendment to the Constitution of the United States.

Whereby the said Whitney Layton plaintiff in error, prays this honorable court to examine and correct the errors assigned and for a reversal of the judgment of the supreme court of the State of Mis-

souri and of the said St. Louis court of criminal correction, entered in the above-entitled cause.

WHITNEY LAYTON,
By SEDDON & BLAIR,
STANLEY STONER,
WINSTON & MEAGHER,
His Attorneys.

JAMES A. SEDDON,
JAMES L. BLAIR,
STANLEY STONER,
SILAS H. STRAUM,
Attorneys for Plaintiff in Error.

And which said bond is in words and figures as follows, to wit:

767 *Bond.*

Know all men by these presents, that we Whitney Layton as principal, and Edward Westen and Max M. Bodenheimer as sureties are held and firmly bound unto the State of Missouri, in the full and just sum of six thousand ($6,000) dollars to be paid to the said State of Missouri, its attorneys, executors, administrators or assigns; to which payment, well and truly to be made, we bind ourselves, our heirs executors and administrators jointly and severally by these presents.

Sealed with our seals and dated this twenty-sixth day of February, in the year of our Lord nineteen hundred and one.

Whereas, lately at a session of the supreme court of Missouri, in a suit pending in said court between State of Missouri as plaintiff against Whitney Layton as defendant a final judgment was rendered against the said Whitney Layton and the said Whitney Layton having obtained the allowance of a writ of error and filed a copy thereof in the clerk's office of the said court to reverse the judgment in the aforesaid suit, and a citation directed to the said State of Missouri citing and admonishing said State of Missouri to be and appear at a Supreme Court at Washington, within thirty days from the date thereof.

Now the condition of the above obligation is such, that if the said Whitney Layton shall prosecute said writ of error to effect, and answer all damages and costs, if he shall fail to make his plea good, then the above obligation is to be void; else to remain in full force and virtue.

WHITNEY LAYTON. [SEAL.]
EDW. WESTEN. [SEAL.]
MAX M. BODENHEIMER. [SEAL.]

Sealed and delivered in the presence of—
CHAS. E. JACQUES.
H. C. GRADY.

Approved, (to operate as a supersedeas)—
T. A. SHERWOOD,
Presiding Justice of Division Number Two of the Supreme Court of the State of Missouri.

768 STATE OF MISSOURI, } ss:
City of St. Louis, }

Edward Westen, being duly sworn states that he is a citizen of Missouri and a resident of the city of St. Louis; that he owns real estate in the State of Missouri over and above all encumbrances homestead rights and exemptions under the law is worth more than the sum of $6,000.00 in cash and that said real estate is of a value greater than $6,000.00 is subject to execution.

EDW. WESTEN.

Subscribed and sworn to before me on this 26th day of Feb'y, 1901. My commission expires Oct. 25, 1903.

Witness my hand and seal hereunto affoxed this 26th day of February, 1901, at office in the city of St. Louis, Missouri.

[SEAL.] STANLEY STONER,
Notary Public, City of St. Louis, State of Missouri.

STATE OF MISSOURI, } ss:
City of St. Louis, }

Max M. Bodenheimer, being duly sworn states that he is a citizen of the State of Missouri and a resident of the city of St. Louis and that he is the owner of personal property clear of all encumbrances and of exemptions under the law and subject to execution of the value of more than the sum of $6,000.00.

[SEAL.] MAX M. BODENHEIMER.

Subscribed and sworn to before me on this 26th day of February, 1901. My commission expires Oct. 25, 1903.

Witness my hand and seal hereunto affixed this 26th day of February, 1901, at office in the city of St. Louis, Missouri.

STANLEY STONER,
Notary Public, City of St. Louis, State of Missouri.

769 STATE OF MISSOURI, } ss:
City of St. Louis, }

I hereby certify that Edward Westen and Max. M. Bodenheimer personally appeared before me on this 26th February A. D. 1901 in the city of St. Louis and acknowledged that they had signed the foregoing bond and that their signatures were their true and genuine signatures.

In witness whereof I have hereunto set my hand and affixed my seal — office this 26th February A. D. 1901. My commission as notary public expires on the 25th day of Oct. 1903.

[SEAL.] STANLEY STONER,
Notary Public, City of St. Louis, State of Missouri.

STATE OF MISSOURI, *set:*

I, Jno. R. Green, clerk of the supreme court of the State of Missouri, certify that the foregoing is a full, true and complete transcript of the record and proceedings in the case of State of Missouri *vs.* Whitney Layton as fully and complete as the same appear of record and on file in my said office.

Seal of the Supreme Court of Missouri.

In witness whereof I have hereunto set my hand as clerk and affixed the seal of said court. Done at office in the city of Jefferson this — day of March, A. D. 1901.

JNO. R. GREEN, *Clerk.*

Endorsed on cover: File No. 18,094. Missouri supreme court. Term No. 281. Whitney Layton, plaintiff in error, *vs.* The State of Missouri. Filed March 29th, 1901.